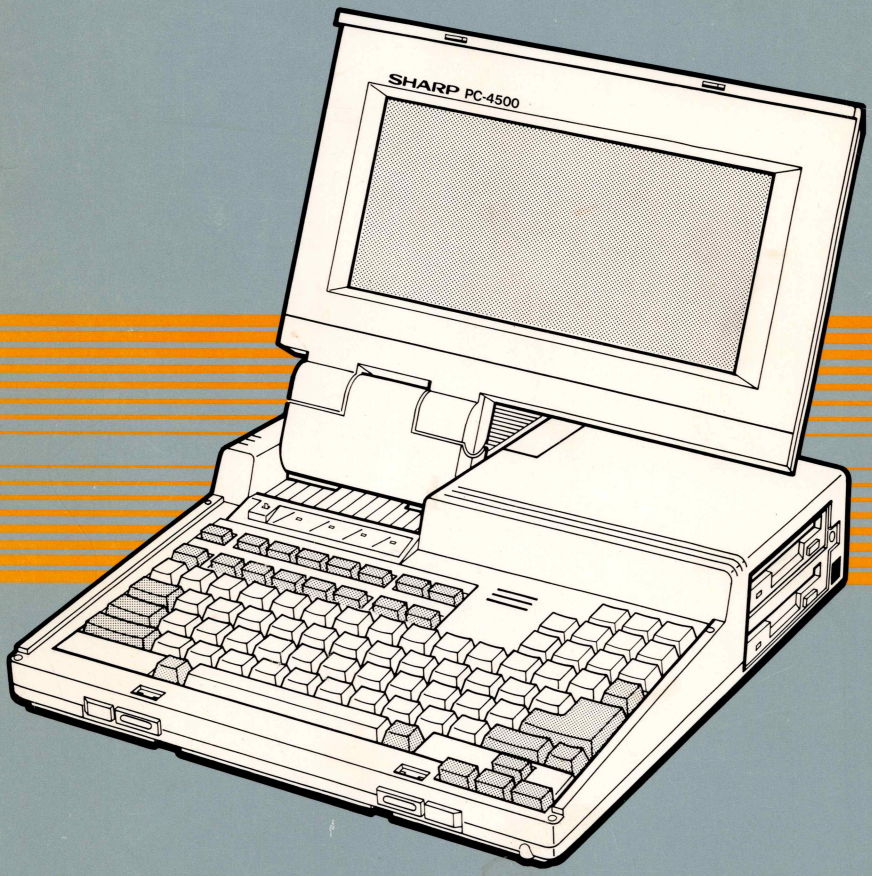
SHARP®

PERSONAL COMPUTER

PC-4502
PC-4521

OPERATION MANUAL



OPERATION MANUAL

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NOTE

This manual is designed for both the PC-4502 and PC-4521. Unless otherwise specified, the contents of the manual applies to both computers. Illustrations in the manual are based on the dual floppy PC-4502. If you are the owner of the PC-4521, please note that your computer has only one floppy disk drive. Also note that the floppy disk drive on the PC-4521 is referred to as drive A in this manual.

WARNING

THIS EQUIPMENT HAS BEEN CERTIFIED TO COMPLY WITH THE LIMITS FOR A CLASS B COMPUTING DEVICE, PURSUANT TO SUBPART J OF PART 15 OF FCC RULES. ONLY PERIPHERALS (COMPUTER INPUT/ OUTPUT DEVICES, TERMINALS, PRINTERS, ETC.) CERTIFIED TO COMPLY WITH THE CLASS B LIMITS MAY BE ATTACHED TO THIS COMPUTER. OPERATION WITH NON-CERTIFIED PERIPHERALS IS LIKELY TO RESULT IN INTERFERENCE TO RADIO AND TV RECEPTION.

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▲ Reorient the receiving antenna.
- ▲ Relocate the computer with respect to the receiver.
- ▲ Move the computer away from the receiver.
- ▲ Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, you should consult your dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet prepared by the Federal Communications Commission helpful:

How to Identify and Resolve Radio-TV Interference Problems

This booklet is available from:

U.S. Government Printing Office
Washington, D.C.
Stock No. 004-000-00345-4
BILLING CODE 6712-01-M

A shielded I/F cable is required to insure compliance with FCC regulation for Class B computing equipment.

SHARP®
SHARP ELECTRONICS CORPORATION
Sharp Plaza · P.O. Box 650 Mahwah, N.J. 07430
Corporate Number (201) 529-8200 · Telex 134-327

Writer's Telephone Number (201) 529-8200

Dear New Customer:

Welcome to the exciting world of Personal Computing. You certainly made a wise decision when you selected Sharp's PC-4500. All the service information you need is contained in the Operation Manual.

Now I would like to take the opportunity to let you know about a great new idea to protect your investment against the high price of service.

It's called **EXTRA** – **EX**tended Time **R**epair **A**greement.

These plans provide that:

PLAN 1: Upon receipt of the defective Equipment at a Sharp Repair Depot, Sharp will repair or exchange the Equipment or any option covered by **EXTRA** on a priority basis and return the Equipment via next day courier service.

PLAN 2: Upon receipt of the defective Equipment at a Sharp Repair Depot, Sharp will repair or exchange the Equipment or any option covered by **EXTRA** on a priority basis and return the Equipment via regular shipping service.

PLAN 3: Upon receipt of the defective equipment at a Sharp Repair Depot, Sharp will repair the Equipment or any option covered by **EXTRA** and return the Equipment via regular shipping service.

The plans cover parts and labor for one full year. They offer you direct access for a full range of post-sale support from our Technical Action Center (**TAC**) as well as a fixed, known charge for service of your equipment and assurance of quality service performed by Sharp Electronics Corporation technicians.

Sharp is committed to supporting this fine product with high quality service. We urge you to take this opportunity to protect your wise investment. Acceptance of this agreement is automatic if you complete and return the enclosed **EXTRA** agreement during the standard warranty period.

Sincerely,

Steve G Wessler,
National Service Manager
Office Automation Systems

PC-4502/PC-4521
EXTRA PRICE SHEET

MODEL	PLAN 1		PLAN 2		PLAN 3	
	ANNUAL	SEE NOTE*	ANNUAL	SEE NOTE*	ANNUAL	SEE NOTE*
PC-4502	$132.00	$11.00	$120.00	$10.00	$102.00	$8.50
PC-4521	$240.00	$20.00	$216.00	$18.00	$180.00	$15.00
CE-451B SIO CARD	$9.00	$0.75	$6.00	$0.50	$3.00	$0.25
CE-453B EMS CARD	$48.00	$4.00	$42.00	$3.50	$36.00	$3.00
CE-451R 128KB RAM CARD	FREE	FREE	FREE	FREE	FREE	FREE
CE-451A CRT ADAPTOR	$21.00	$1.75	$18.00	$1.50	$15.00	$1.25
CE-452F 5.25" OPTION FDD	$42.00	$3.50	$36.00	$3.00	$30.00	$2.50
CE-451M MODEM CARD	$30.00	$2.50	$24.00	$2.00	$18.00	$1.50

Make check or money order payable to SHARP ELECTRONICS CORPORATION and attach proof of purchase to contract form. A self addressed, stamped envelope has been provided in this packet. A copy of the contract will be returned to you for your records. If the unit has been purchased in the name of a business, be sure to indicate such on the contract.

If you select Plan 3 only at the time of equipment purchase, Sharp will make such contract effective the first day following the 1 year limited warranty. Proof of purchase required.

NOTE* If you are adding one of the options to your PC-4502/ PC-4521 and you already have a contract and wish both the main contract and the add-on to expire at the same time, please use the pro-rated monthly contract price shown multiplied by the number of months until the main contract expires. Be sure to include a copy of your original EXTRA Contract.

SHARP ELECTRONICS CORPORATION
EXTENDED TIME REPAIR SERVICE AGREEMENT

THIS SERVICE AGREEMENT PROVIDES YOU WITH:

* Service as near as your phone via Sharp's Technical Action Center (TAC) during our normal business hours.
* Service performed by Sharp's own Trained Technicians (see the reverse side).
* Parts replaced without charge on an exchange basis (see the reverse side for exceptions).
* Multi-option Plans to fit your needs (see the reverse side for details).

PLAN #1 –
Upon receipt of the defective Equipment at a Sharp Repair Depot, Sharp will repair or exchange the Equipment or any option covered by EXTRA on a priority basis and return the Equipment via next day courier service.

PLAN #2 –
Upon receipt of the defective Equipment at a Sharp Repair Depot, Sharp will repair or exchange the Equipment or any option covered by EXTRA on a priority basis and return the Equipment via regular shipping service.

PLAN #3 –
Upon receipt of the defective Equipment at a Sharp Repair Depot, Sharp will repair the Equipment or any option covered by EXTRA and return the Equipment via regular shipping service.

Model No. Serial No.

_____ / _____
_____ / _____
_____ / _____
_____ / _____
_____ / _____

I have selected EXTRA Plan #____. Enclosed is my check for $_____

_____
Contract Number

CUSTOMER INFORMATION

_____
Full legal name of customer (DBA, if any)

_____
Corporate/Principal Address

_____
Street & Number

_____
Selling Dealer

_____
Sharp Account No.

CUSTOMER

By: _____
Title: _____
Date: _____

SHARP ELECTRONICS CORPORATION

By: _____
Title: _____
Date: _____

THE TERMS & CONDITIONS ON THE REVERSE ARE PART OF THIS AGREEMENT

1. MAINTENANCE SERVICES

During the term hereof Sharp will repair, in accordance with the service plan indicated on the face hereof and the other terms and conditions of this Agreement, the Equipment or any part of the Equipment (other than accessories, attachments or other devices not furnished by Sharp) which becomes unserviceable due to normal usage (other than consumable supplies, batteries and disk media). Equipment and parts will be furnished on a repair basis and will at Sharp's option be remanufactured or used; Equipment and all parts removed due to repairs will become the property of Sharp. Maintenance services provided by Sharp under this Agreement do not include the following:

a. repairs resulting from misuse (including without limitation improper voltage or the use of accessories or supplies that do not conform to the manufacturer's specifications) or from damage (including without limitation transportation damage due to improper packing)

b. such repairs as may be necessary to bring the Equipment within specifications at the beginning of this Agreement if this Agreement does not begin during or immediately after the period of Sharp's limited warranty with respect to the Equipment.

c. repairs made necessary by service performed by persons other than Sharp.

d. reconditioning, rebuilding, overhaul or modification of the Equipment.

e. provision or replacement of consumable items such as floppy disks.

Maintenance services as described above will be provided Monday through Friday except holidays during Sharp's normal business hours. In the case of plans which provide for the priority repair or exchange of Equipment, such priority repair or exchange will be made during normal business hours at Sharp's service locations and returned to the Customer's location indicated on the face hereof; other maintenance will be provided at Sharp service locations designated from time to time.

2. CHARGES

The charges hereunder as set forth in Sharp's EXTRA price list will be payable by the Customer in advance in respect of the term of this Agreement; in the event of termination such charges will be prorated and the unearned portion thereof will be refunded to Customer. Repairs not included in maintenance services as described above will be at Sharp's prevailing rates for parts and labor and will be payable upon invoice. In the event Customer fails to pay any amount due hereunder Sharp may offset the unearned portion of maintenance charges hereunder. Taxes (other than taxes measured by income) with respect to this Agreement and the services performed hereunder will be the responsibility of Customer.

3. TERM AND TERMINATION

This Agreement, which replaces the unexpired period, if any, of Sharp's limited warranty with respect to the Equipment, becomes effective as of the date it is signed by Sharp and continues in effect for each unit of Equipment for a period of one year. At such expiration this Agreement will renew automatically, at the prevailing rates for maintenance charges at the time of such renewal, unless terminated by Customer in writing. This Agreement may be terminated by either Customer or Sharp at any time upon 30 days written notice to the other.

4. CUSTOMER OBLIGATION

Customer agrees to perform normal operator functions as described in the Operator's Manual for the Equipment. Supplies for use with the Equipment will meet the manufacturer's specifications. Customer represents to Sharp that any Equipment shipped to Sharp for repair or exchange is owned free and clear of any agreements, claims or encumbrances and has not been subjected to misuse or damage. Customer will indemnify Sharp against any claim asserted by a third party with respect to Customer's Equipment and will be responsible for the cost of repairing, at Sharp's prevailing rates, misused or damaged exchange Equipment.

5. LIMITATIONS

There are no warranties, including the implied warranties of merchantability and fitness for a particular purpose, not specified herein respecting the parts and maintenance services provided under this Agreement. Sharp shall not be liable for non-performance caused by circumstances beyond its control including but not limited to, work stoppages, fire, civil disobedience, riots and act of God. In no event will Sharp be liable for any indirect, special or consequential damages arising out of this Agreement or services provided under this Agreement. Customer's exclusive remedy and Sharp's entire liability in contract, tort or otherwise, is the repair or exchange of Equipment or parts thereof which Sharp determines are defective.

6. GENERAL

This Agreement is not assignable by Customer. Any attempt to assign or transfer any of the rights, duties or obligations hereof is void.

The headings and titles of this Agreement are inserted only for convenience and shall not affect the interpretation or construction of any provisions.

Any failure by either party to require conformity to all provisions hereof shall not be deemed a waiver of future conformity to such provisions.

This Agreement shall be governed by, and construed according to, the laws of the state of New York.

The foregoing terms and conditions and those contained in prevailing price lists described herein constitute the entire Agreement between Customer and Sharp with respect to its subject, irrespective of inconsistent or additional terms and conditions in Customer's purchase orders or other documents of Customer. Any limited warranty of Sharp outstanding with respect to the Equipment and all other prior agreements, proposals, and understandings with respect to the subject matter of this Agreement are merged herein, and there are no promises, terms, conditions or obligations with respect thereto other than those contained herein. This document is not a contract until signed by Sharp; it may be amended only by written instrument executed by both parties.

Written notice required by this Agreement shall be addressed to the parties at the addresses indicated on the face hereof or such other addresses as either party shall have previously furnished from time to time in writing to the other.

SHARP REPAIR DEPOTS

Sharp Plaza
Mahwah, NJ 07430

725-C Old Norcross Rd.
Lawrenceville, GA 30245

20600 S. Alameda St.
Carson, CA 90810

1205 Executive Drive
Richardson, TX 75080

1300 Naperville Drive
Romeoville, IL 60441

Limited Warranty
Main unit and peripherals

Sharp Electronics Corporation warrants to the first consumer purchaser, for a period of one (1) year from the date of purchase, that these products (the "Product"), when shipped in their original containers, will be free from defective workmanship and materials, and agrees that it will, at its option, either repair the defect or replace the defective Product or part thereof at no charge to the purchaser for parts or for labor.

This warranty does not apply to any appearance items of the Product, any consumable items such as paper, ribbon, batteries or disk media supplied with the Product or to any equipment or any hardware, software, firmware, electro-luminescent panel, power cords, motors, covers, or rubber parts other than the Product. This warranty does not apply to any Product the exterior of which has been damaged or defaced, which has been subjected to misuse, abnormal service or handling, or which has been altered or modified in design, construction or interfacing.

In order to enforce the rights under this limited warranty, the purchaser should mail, ship or carry the Product, together with proof of purchase, to a Sharp Service Center. To find out the location of the nearest Sharp Service Center see the back of this manual. This warranty does not apply to any product purchased outside of the United States, its territories, or possessions.

The limited warranty described above is in addition to whatever implied warranties may be granted to purchasers by law. To the extent permitted by applicable law, ALL IMPLIED WARRANTIES INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE ARE LIMITED TO THE PERIOD FROM THE DATE OF PURCHASE SET FORTH ABOVE. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

Neither the sales personnel of the seller nor any other person is authorized to make any warranties other than those described above, or to extend the duration of any warranties beyond the time period described above on behalf of Sharp Electronics Corporation.

The warranties described above shall be the sole and exclusive remedy available to the purchaser. Correction of defects, in the manner and for the period of time described above, shall constitute complete fulfillment of all liabilities and responsibilities of Sharp Electronics Corporation to the purchaser with respect to the Product, and shall constitute full satisfaction of all claims, whether based on contract, negligence, strict liability or otherwise. In no event shall Sharp Electronics Corporation be liable, or in any way responsible for any damages or defects in the Product which were caused by repairs or attempted repairs performed by anyone other than a Sharp Service Center technician. Nor shall Sharp Electronics Corporation be liable or in any way responsible for any incidental or consequential economic or property damage. Some states do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you.

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For Your Records

Please record below the model number and serial number, for easy reference, in case of loss or theft. These numbers are located on the back of the unit. Space is provided for further pertinent data.

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Place of Purchase: _____

LIMITED USE LICENSE AGREEMENT

You should carefully read the following terms and conditions before using the Microsoft MS-DOS/GW-BASIC software provided with the computer (the "Software"). This is a legal document which constitutes the agreement between you, the end user, and Sharp Corporation for the use of the Software. Using the Software indicates your acceptance of the terms of this Agreement, which includes the Limited Use Software License and Limited Warranty.

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Welcome

If you are new to the family of Sharp products, welcome. To all new owners of this computer, congratulations. You have purchased one of the most powerful – and easy to use – personal computers available today.

By using advanced technology, we were able to pack the power of larger personal computers into this compact system. On the job or at home, you will find this to be an exceptional computer.

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Introduction

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Overview

This chapter is an introduction to the Operation Manual.

The first section describes how to use this manual and includes a summary of each chapter.

The second section is an introduction to the system.

How to Use This Manual

This manual describes the operation of the Sharp personal computer. In it, you will find all the information you need to become an accomplished user of this powerful computer.

We have designed the Operation Manual so that you can locate information quickly and easily. Each chapter begins with a title page that shows the major sections in the chapter. Titles at the top of each page help you to locate sections within chapters.

Here is an overview of what to expect in each chapter:

Chapter 1 is the introduction to the manual. It tells you how to use the manual and provides an overview of the system.

Chapter 2 describes how to set up the system as well as how to close down the system for travel.

Chapter 3 tells you how the system works together. You will see how the basic hardware and software of the computer combine to give you powerful computing capabilities.

Chapter 4 describes how to use the system to accomplish your computing needs.

Chapter 5 provides an overview of the MS-DOS* features that are used on a regular basis when operating the computer.

Chapter 6 describes the internal options – RAM expansion, CE-451A color/monochrome CRT adaptor, serial I/O Card and CE-451M modem card.

Chapter 7 describes the CE-452F external 5-1/4" floppy disk drive unit.

Appendices cover a variety of topics such as general maintenance, diagnotics, glossary and specifications.

Index helps you locate specific information quickly.

What to Read

If you plan on performing one of the tasks below, we recommend you read the corresponding chapters.

Of course, you may perform more than one of these tasks.

- Set up the system – Chapters 1 and 2
- Run an application – Chapters 1, 3, 4 and 5
- Use internal options – Chapters 1 and 6
- Use external floppy disk drive – Chapters 1 and 7
- Perform maintenance – Chapter 1 and Appendices

Documentation Conventions

Throughout this manual we have used a set of style conventions. These conventions are described below.

Keyboard Keys. When referring to specific keys on the keyboard, the key label appears in boldface as shown below.

Example:

Press **Enter** to end the command.

Sample Screens. This manual contains sample screens. These samples include prompts (text generated by the system) and entries that you type on the keyboard.

As shown below, prompts are shown in normal type and your entries are shaded.

```
A>DIR A:

Volume in drive A has no label
Directory of A:\

SALESREP  DOC  104960   11-11-87  12:00a
MEMO      DOC    3072   11-11-87   9:15a
        2 File(s) 611968 bytes free
```

Command Names. When referring to MS-DOS* commands, the command name is written in uppercase as shown below.

Example:

Use COPY to move the file from one disk to another.

Notes. Notes are used to give you helpful hints or suggestions on ways of doing certain operations.

Cautions. Cautions are used to alert you that damage to the equipment or loss of data might occur if certain procedures are not followed carefully.

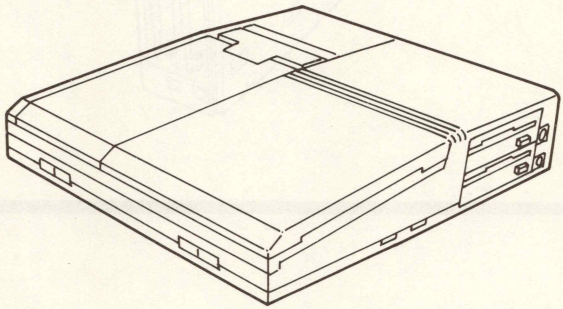
Warnings. Warnings are used to warn you that bodily injury might occur if precautions are not taken. Warnings always appear in italic.

Overview of the System

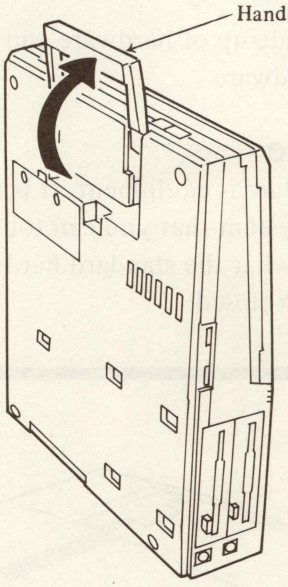
Your system is made up of hardware and software. Let's begin with the hardware.

The Hardware

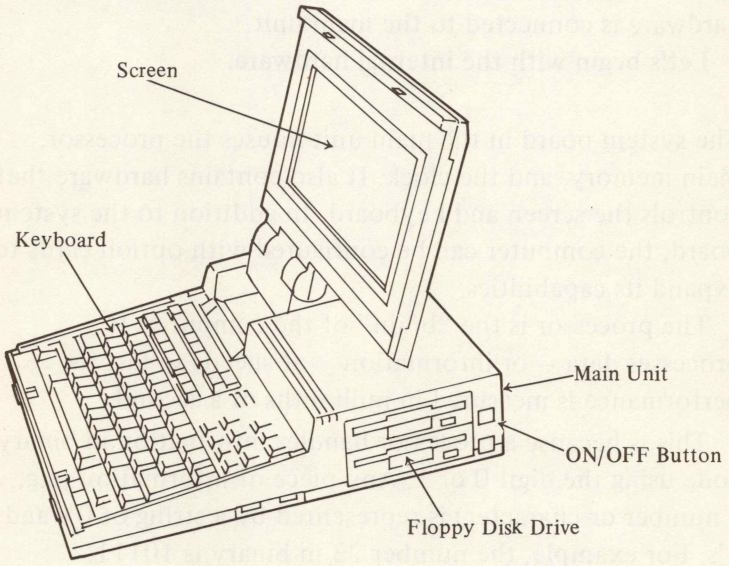
Simply put, hardware is equipment. It is the physical part of the computer system that you can touch. The illustration below shows you what the standard hardware looks like when the system is closed.



As you can see, the entire system can be carried by the handle.



Here's how the standard hardware looks when the system is set up.



Let's look at each piece.

The Main Unit. The main unit houses the keyboard, screen, two (PC-4502) or one (PC-4521) floppy disk drives, one hard disk drive (PC-4521), one parallel I/O (input/output) port, one port for the external floppy disk drive unit, and internal hardware needed to run your computer. All other hardware is connected to the main unit.

Let's begin with the internal hardware.

The system board in the main unit houses the processor, main memory, and the clock. It also contains hardware that controls the screen and keyboard. In addition to the system board, the computer can be configured with option cards to expand its capabilities.

The processor is the "brain" of the computer. It processes data – or information – at speeds so fast its performance is measured in millionths of a second.

This is because a processor handles information in binary code using the digit 0 or 1. Any piece of information (e.g., a number or character) is represented by a string of 0's and 1's. For example, the number 23 in binary is 10111.

A 0 or 1 in a binary system is referred to as a bit, the smallest piece of information handled by the processor. A byte is a group of bits representing a single character or number such as "H" or "9".

The standard processor for this computer is an 80188 compatible processor.

Main memory, usually referred to as RAM (Random Access Memory), stores data and applications software for the processor.

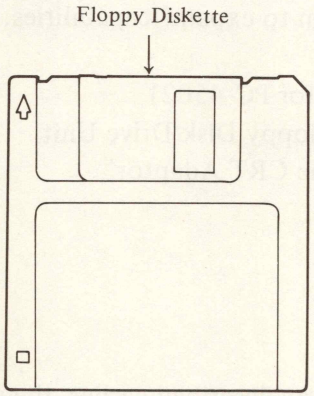
RAM is measured by the amount of information (bytes) it can store. A symbol often used for this measurement is "K". One K represents 1024 bytes.

The standard system guarantees a minimum of 256K (PC-4502) or 640K (PC-4521) usable memory.

Also inside the system is a clock that keeps track of the date and time, even when the system's power is turned off, and a speaker that provides audio feedback during certain operations.

Let's move on to the remaining system hardware – the disk drive, the screen, and the I/O ports.

Floppy Disk Drive. The computer contains two (PC-4502) or one (PC-4521) floppy disk drive(s) for storage and retrieval of information. Floppy diskettes like the one shown below can store up to 720K of information.



Hard Disk Drive. The computer (PC-4521 only) contains a hard disk drive which can store up to 20 megabytes of information. One megabyte represents 1024K.

Screen. The screen acts as a window where the processor sends information for you to view. Information typed at the keyboard, read from a floppy diskette, or sent via a modem, etc. is displayed here.

The computer displays 80 characters x 25 lines or 640 dots horizontally x 200 dots vertically on an illuminated crystal display.

I/O Ports. The computer has two I/O (input/output) ports for connecting external devices to the system – a parallel port, used to connect a printer, and a port for connecting an external 5-1/4 inch floppy disk drive unit.

Keyboard. You communicate with the main unit by typing at the keyboard. Many of the keys work just like those on a regular typewriter. However, as you will see, some of the keys have special functions not available on a typewriter.

Hardware Options

The hardware described above comprises the standard system. The following hardware options can be used with the standard system to expand capabilities:

- Additional RAM (for PC-4502)
- External 5-1/4" Floppy Disk Drive Unit
- Color/Monochrome CRT Adaptor
- Serial I/O Card
- Modem Card
- ROM Disk Board
- EMS Card

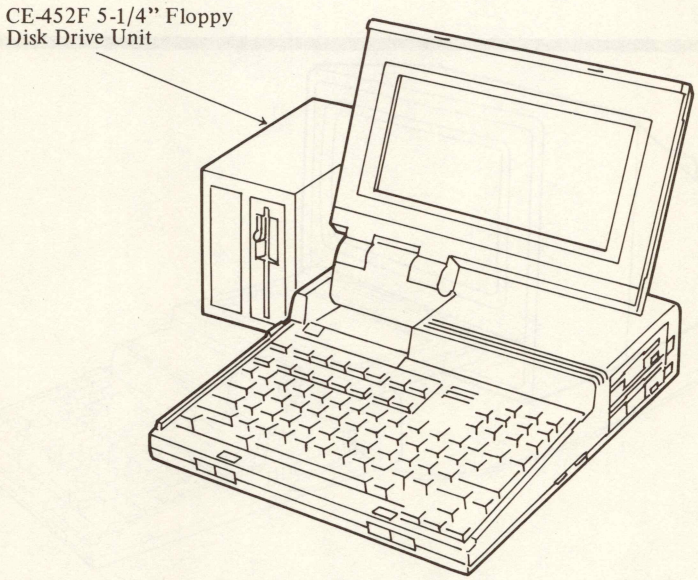
Additional RAM. As described earlier, the standard PC-4502 comes with 256K RAM.

You may need to increase this capacity to accomplish certain tasks on the system.

You can increase the memory by installing the CE-451R RAM card and the CE-700R RAM expansion kit in the main unit in increments of 128K up to a total of 640K.

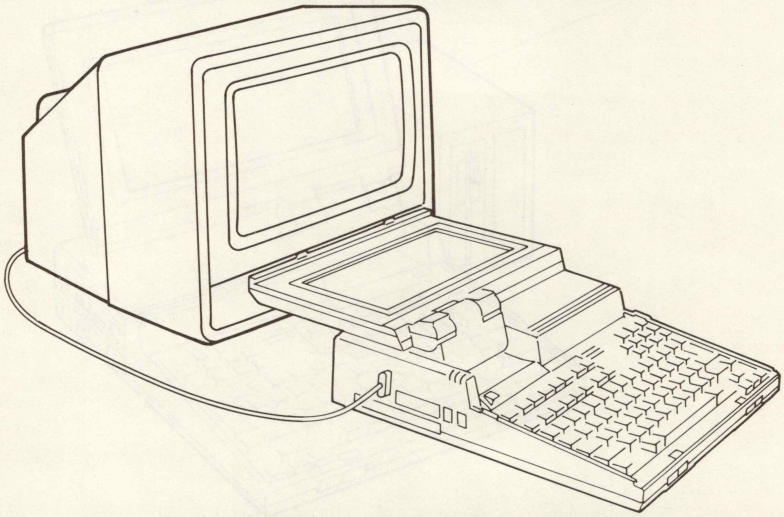
Since the PC-4521 contains 640K RAM as standard, no additional RAM can be installed.

External 5-1/4 inch Floppy Disk Drive Unit. The computer has one port for connecting a 5-1/4 inch floppy disk drive to the system. You can easily connect the drive unit CE-452F to the system.



Color/Monochrome CRT Adaptor. A color or monochrome CRT (short for Cathode Ray Tube) can be used in addition to the standard screen. In order to use a CRT, the CE-451A color/monochrome CRT adaptor must be installed in the main unit.

Here's how the system looks when a CRT is attached to the main unit.



Serial I/O Card. By installing the CE-451B serial I/O card, the computer can communicate with external devices such as a serial printer, external modem, and mouse pointing device.

Modem Card. A modem (short for MOdulator DEModulator) is a device that converts computer data into data that can be transmitted over telephone lines.

The CE-451M modem card can be installed inside the computer. With the CE-451M modem card, you can send and receive information at speeds up to 120 characters per second (i.e., 1200 baud). The CE-451M contains a serial I/O adaptor for alternate use.

ROM Disk Board. This board can be customized to store software programs for easy execution. For details, contact your Sharp dealer.

EMS Card. The CE-453B EMS card is a 1M byte memory board which conforms to the Lotus*/Intel*/Microsoft* expanded memory specifications.

The Software

In order to use computer hardware for tasks like writing memos or balancing a checking account, software is required.

Software is a series of instructions that direct the computer to perform specific tasks. It is generally loaded into main memory from a floppy diskette where it remains until the system is turned off or other software is loaded.

Software (sometimes referred to as programs) can be divided into three categories – operating system software, programming languages, and applications software.

Operating System Software. Operating system software manages the computer's resources such as disk drives and printers. By performing these general routines, operating system software forms the base on which applications software can run.

The operating system software for this computer is MS-DOS*, version 3.21. The diskette packaged with the computer contains this software.

Programming Languages. You can write programs using various languages. The computer provides GW-BASIC* version 3.2 as its standard programming language.

Applications Software. Applications software helps you perform business and personal tasks such as word processing, spreadsheet analysis, and graphics presentations.

Many of the applications written to run with MS-DOS* can be used on this computer.

Set Up and Close Down

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Picking a Location 2-3

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Overview

This chapter describes how to set up and close down the standard system.

The first section shows you how to pick the right location for setting up the system.

The second section provides instructions on how to set up the system.

The third section describes how to close the system for transportation.

If you are setting up any of the options such as the color/monochrome CRT adaptor, turn to the appropriate chapter for installation instructions once the standard system is set up.

Picking a Location

You will want to begin setting up your system by picking the right location for its use. While this computer is small enough to be used almost anywhere, certain guidelines should be followed so that you can operate the system comfortably and safely.

Environmental Requirements

Surface. Pick a hard, flat surface on which to set up and operate the system. Using the system on a bed or rug restricts the air circulation and could result in static electricity affecting the performance of the system.

A table or desk with room to spread out materials such as manuals, diskettes, and papers is the best choice. If you are using a printer with the system, be sure you have enough room for this piece of equipment as well.

Temperature. This computer does not require any external cooling system such as air conditioning in a normal environment. However, do not operate the system in extreme temperatures below 10 degrees C (50 degrees F) or above 35 degrees C (95 degrees F).

Humidity. Like any electrical device, the computer can be damaged by extreme moisture or humidity. Do not operate the system in humidity above 80 percent.

Lighting. The computer's illuminated crystal display provides easy viewing even in relatively low light.

Electrical Requirements

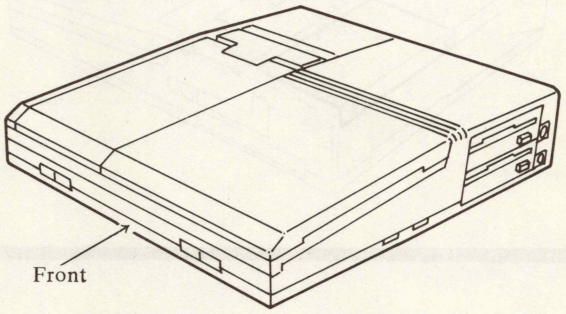
The following electrical requirements must be considered when picking a spot for the computer.

Power Supply. This computer is powered by a built-in lead battery. The lead battery is recharged by using the AC adaptor. It is fully charged in approximately 8 hours when the computer is turned off. The fully charged battery allows the computer to run for approximately 2.7 hours (PC-4502) or 2 hours (PC-4521) when the disk drive is used at the rate of 10 percent and the backlight is on.

Interference. It is possible that radio and television interference can occur when running the system, even if the equipment is installed properly. Therefore, use the equipment away from radios and televisions.

Setting Up

Begin by placing the system on a flat surface with the front facing you as shown below. Be sure to fold down the handle so that it is out of your way.



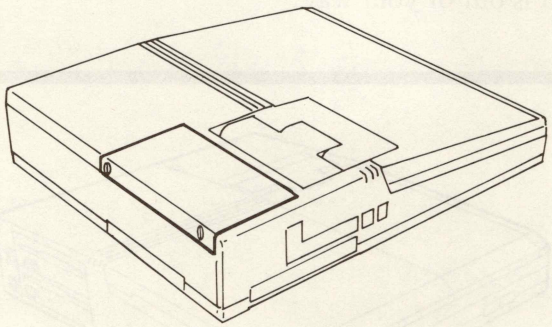
There are four basic steps to setting up your computer:

1. Install the lead battery.
2. Press the two buttons at the front of the main unit to open the unit.
3. Adjust the screen angle.
4. Install the options as necessary.

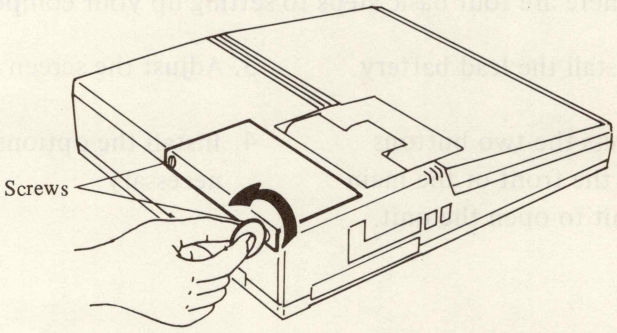
Install the lead battery

When you purchase the computer, you must install the lead battery into the computer in the following manner:

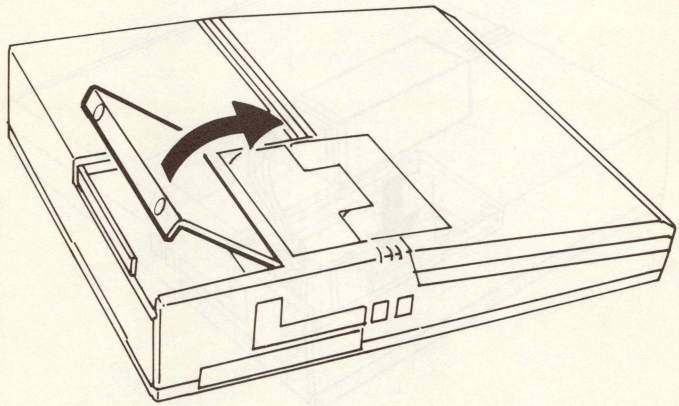
First, place the unit as shown below.



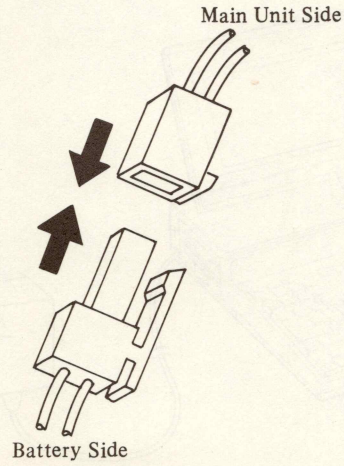
1. Using a coin, loosen, but do not remove, the two screws.



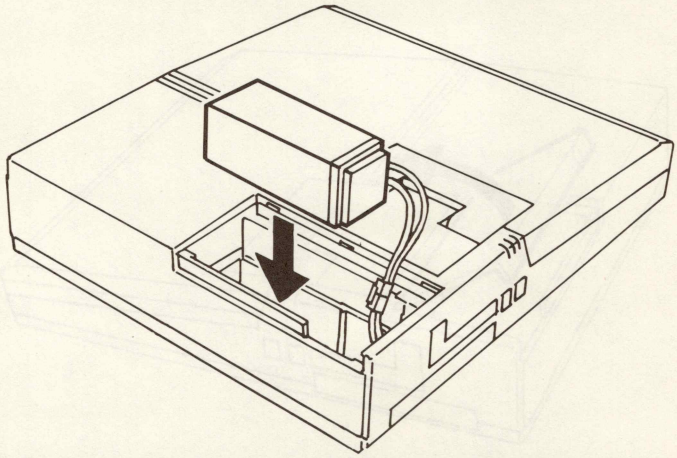
2. Remove the cover.



3. Plug the connector attached to the battery into the connector in the main unit.

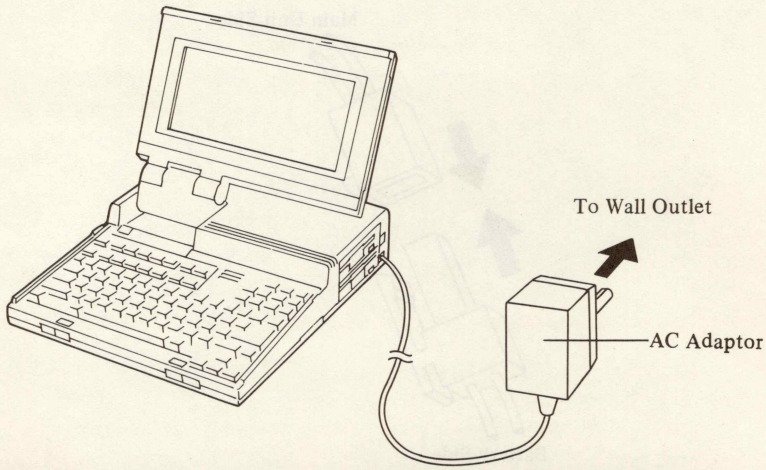


4. Set the battery carefully in the main unit as shown below.



5. Replace the battery cover.

6. Charge the battery using the AC adaptor.



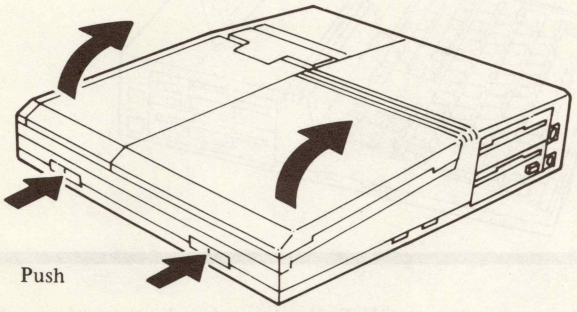
Note: The AC adaptor may be different in some countries.

Note: The lead battery is fully charged before shipping from the manufacturer. However, battery life may be reduced as a result of spontaneous discharge during transit. Be sure to charge the battery for approximately 8 hours using the AC adaptor.

7. Power On
   When the computer is first turned on after the battery is installed, the set up menu appears on the screen. When setting up, refer to Set Up Functions in Chapter 4 "Using the Computer".

Adjust the Screen Angle

When the unit is opened, the screen and keyboard are ready for use.

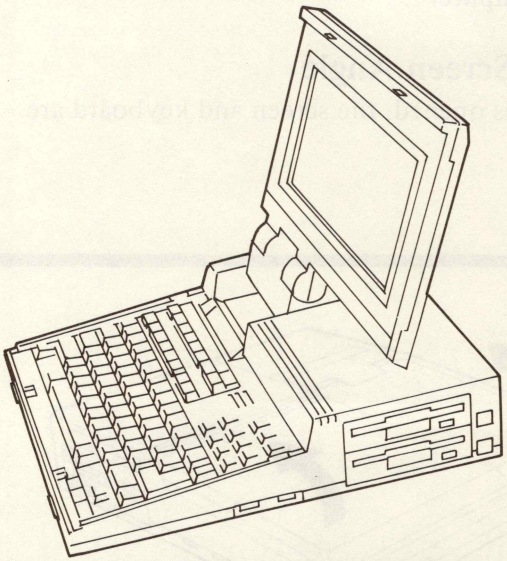


To adjust the screen angle, follow the procedure below.

1. Locate and press the release buttons at the front of the unit.

2. Open the screen panel until it stands upright.

3. Set the screen panel at any viewing angle.



Note: When you use a CRT display attached to the color/monochrome CRT adaptor, tilt the screen panel fully back to a horizontal position so that it does not block the CRT display.

Install Hardware Options

If you are using options such as the EMS card, see the installation instructions supplied with the option.

Note: Installation instructions for the CE-451R/CE-700R RAM expansion, CE-451A color/monochrome CRT adaptor, and CE-452F 5-1/4 inch floppy disk drive unit are supplied as standard sections in this manual.

If you are not using any options, proceed to Chapter 3 for instructions on operating the computer or to the last section of this chapter for instructions on how to close the system.

Closing Down

This computer is easily transported. It folds up in seconds and is light enough to carry from one location to another. An optional carrying case is available for extensive travel use.

There are four basic steps to closing down the system for transportation:

1. Disconnect any options such as a printer or CRT.

2. Disconnect the AC adaptor plug (if the battery has been charged).

3. Close the screen panel.

4. Pull out the handle.

CAUTION: Be sure that the power to all equipment is turned off before you begin to close down the system for transportation.

Disconnect Options

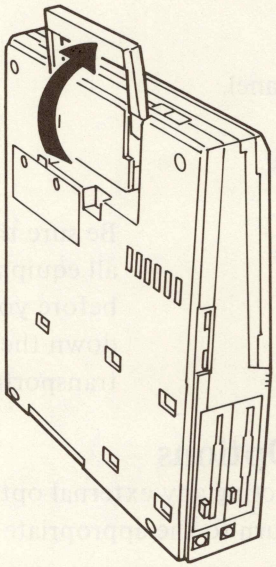
Begin by disconnecting any external options such as a printer or CRT. Turn to the appropriate chapter for these instructions.

CAUTION: If you attempt to close the screen panel without turning off power, an alarm beep sounds for about 15 seconds. Whenever you hear a beep, press the ON/OFF button to turn power off.

Take out Handle

The computer's carrying handle can be set as shown below.

Note: When operating the computer, put the handle inside the bottom panel.



Note: When transporting the computer, the CE-451C optional carrying case should be used.

Storage

If you are planning to store the computer, follow these environmental requirements.

Temperature. Do not store the system in temperatures below −20 degrees C (−4 degrees F) or above 60 degrees C (140 degrees F).

Humidity. Do not store the system in humidity greater than 90 percent.

Note: If you plan to store the system for an extended period of time, the built-in battery will discharge and the clock and set up selections will be lost. For longer service life of the lead battery, recharge it every 6 months.

How It Works

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Overview

This chapter describes how to operate and control the computer.

The first section describes how to operate the main unit's screen and floppy disk drive.

The second section describes how to use the keyboard.

The third section provides an overview of how software is used with the system.

The fourth section describes how to properly handle floppy diskettes.

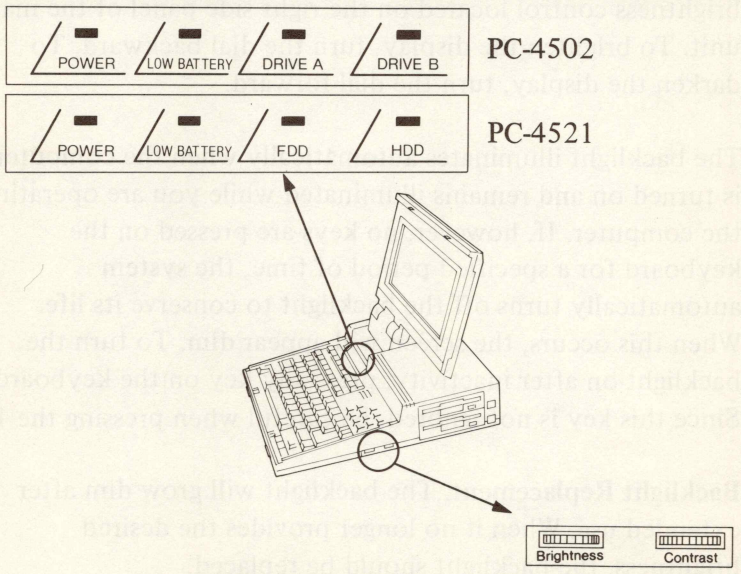
The fifth section shows the character set of this computer.

The Main Unit

The main unit is the heart of the system. In addition to processing, displaying and storing data, it also serves as the connector point for external devices such as a printer, telephone, and CRT. Let's take a closer look at the main unit.

First, if you have not already done so, set up the computer as described in Chapter 2. Next, sit down in front of the system while we take a quick tour.

The indicator panel, the screen contrast control and brightness control of the main unit are illustrated below.



The Screen

The screen displays text and graphics on a flat panel supertwist illuminated crystal display. Normally, information displays as dark characters on a light background. You can also configure the screen to display light characters on a dark background.

These are three important features for controlling the screen:

- Brightness
- Contrast
- Tilt

Brightness. A backlight located directly behind the screen controls brightness of the display background. The backlight's brightness can be adjusted by turning the brightness control located on the right side panel of the main unit. To brighten the display, turn the dial backward. To darken the display, turn the dial forward.

The backlight illuminates automatically when the computer is turned on and remains illuminated while you are operating the computer. If, however, no keys are pressed on the keyboard for a specified period of time, the system automatically turns off the backlight to conserve its life. When this occurs, the screen will appear dim. To turn the backlight on after inactivity, press any key on the keyboard. Since this key is not ignored, be careful when pressing the key.

Backlight Replacement. The backlight will grow dim after extended use. When it no longer provides the desired brightness, the backlight should be replaced.

Contact you Sharp authorized dealer or Sharp service center for replacement of the backlight panel.

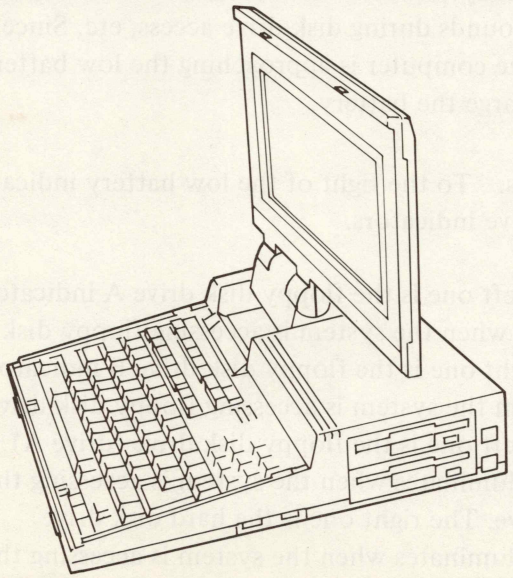
Contrast. The contrast between the information that appears on the screen and the background can be adjusted by turning the contrast control located on the right side panel. To lighten the display, locate the contrast control and turn the dial forward. To darken the display, turn the dial back ward.

Tilt. To easily view the screen in many sitting positions, the tilt of the screen can be adjusted.

First open the screen so that it stands upright. The screen is locked. After that, you can set the screen at any angle backward.

When you use a CRT display through the color/ monochrome CRT adaptor, the screen can be folded down so that view to the CRT display is not hindered.

The illustration below shows the screen in an upright position.



Indicator Panel

There are four indicators on the front panel.

Power. When power is turned on to the main unit, this indicator illuminates.

Low Battery Indicator. To the right of the power indicator is the low battery indicator. When battery voltage drops, the low battery indicator lights and a buzzer sounds for approximately 15 seconds, alerting you to charge with the AC adaptor. If you fail to recharge the battery when the low battery indicator lights, the computer is automatically turned off after approximately 30 (PC-4502) or 10 (PC-4521) minutes when the disk drive is used at the rate of 10 percent with the backlight on to protect the hardware. If this occurs, recharge the battery immediately. Otherwise the clock and set up selections will be lost.

Note: Occasionally, the low battery indicator blinks and an alarm beep sounds during disk drive access, etc. Since this indicates the computer is approaching the low battery condition, recharge the battery.

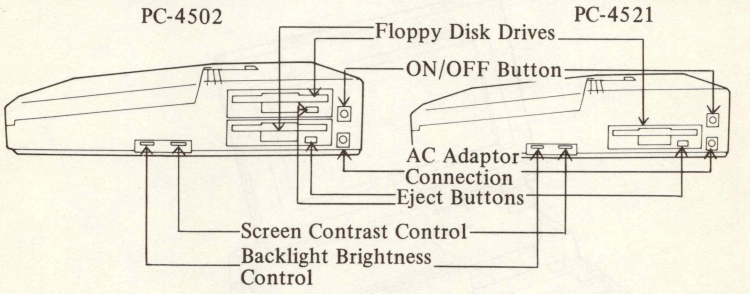
Drive Indicators. To the right of the low battery indicator are two disk drive indicators.

PC-4502: The left one is the floppy disk drive A indicator and illuminates when the system is accessing floppy disk drive A. The right one is the floppy disk drive B indicator and illuminates when the system is accessing floppy disk drive B.
PC-4521: The left one is the floppy disk drive (drive A) indicator and illuminates when the system is accessing the floppy disk drive. The right one is the hard disk drive indicator and illuminates when the system is accessing the hard disk drive.

Let's move on to the right side panel.

Right Side Panel

The right side panel contains the backlight brightness control, the screen contrast control, disk drive slots, disk drive eject button(s), AC adaptor connection and ON/OFF button.



Backlight Brightness Control. There is a control to adjust backlight brightness. Its function is explained in section "Screen".

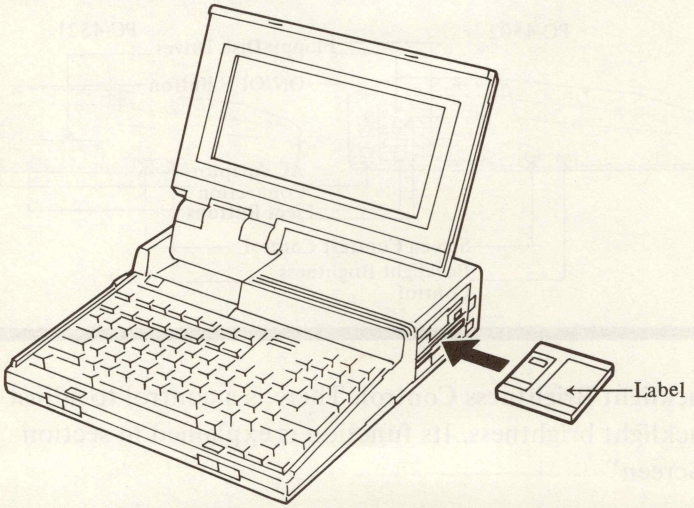
Screen Contrast Control. To the right of the backlight brightness control is a control to adjust the liquid crystal display contrast. Its function is explained in Section "Screen".

Disk Drive Slot(s). To the right of the screen contrast control are two (PC-4502) or one (PC-4521) floppy disk drives. For the PC-4502, the lower slot is drive A and the upper slot is drive B.

Eject Button(s). There is an eject button(s) for the disk drive(s). It is used to eject the diskette when finished.

CAUTION: Never push the eject button with no diskette in the disk drive.

The illustration below shows how to insert a floppy diskette into a drive.



To insert a diskette, do the following:

1. Remove the diskette from its storage case.

2. Grasp the diskette by the top and insert into the drive slot so that the diskette label is facing upward.

3. Gently push the diskette into the slot until it comes to a stop.

Note: Be sure to read the section in this chapter about how to handle floppy diskettes.

To remove a diskette, do the following:

1. Press the eject button to partially eject the diskette from the drive.

2. Grasp the diskette and gently pull it out of the drive.

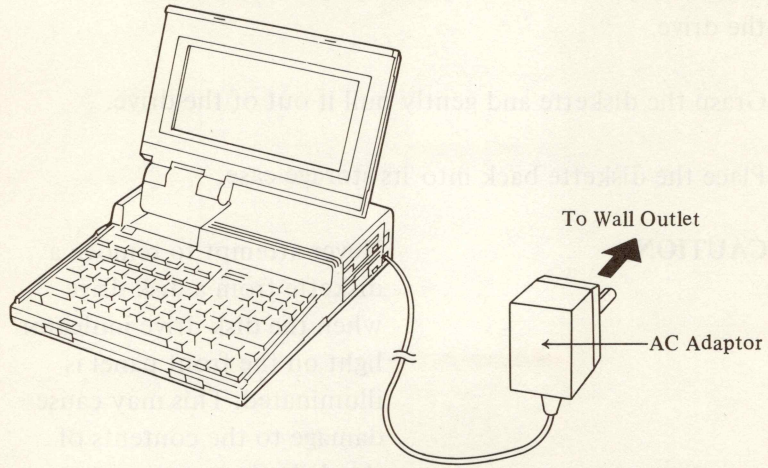
3. Place the diskette back into its storage case.

CAUTION: Never attempt to remove a diskette from a disk drive when the disk drive indicator light on the front panel is illuminated. This may cause damage to the contents of the diskette.

Power ON/OFF Button. To turn on the main unit, press the ON/OFF button. To turn off the main unit, press the ON/OFF button again.

AC Adaptor Connection. The computer can be powered from battery only, AC adaptor only, or can be used while being charged. When the low battery indicator lights while the computer is running, recharge the battery with the AC adaptor.

The illustration below shows how to connect the AC adaptor.



Note: The AC adaptor may be different in some countries.

With the computer turned off, the battery is fully recharged after approximately 8 hours.

AC Adaptor. The AC adaptor can serve either as the lead battery recharger or as the computer power source. This adaptor can be used without the lead battery or when the battery has been discharged significantly. Note that the content of clock/calendar and set up function will be lost if the AC adaptor is removed when no battery or a discharged battery is present.

CAUTION: Never use any AC adaptor other than the one provided. Do not use the AC adaptor for other equipment. Otherwise equipment may be damaged due to nonconformity of rated

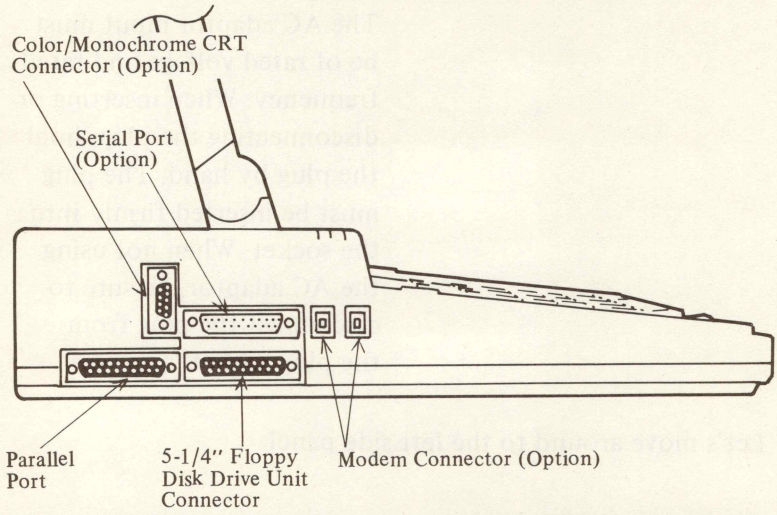
voltage, current and polarity. The AC adaptor input must be of rated voltage and rated frequency. When inserting or disconnecting the plug, hold the plug by hand. The plug must be inserted firmly into the socket. When not using the AC adaptor, be sure to disconnect the plug from the plug socket.

Let's move around to the left side panel.

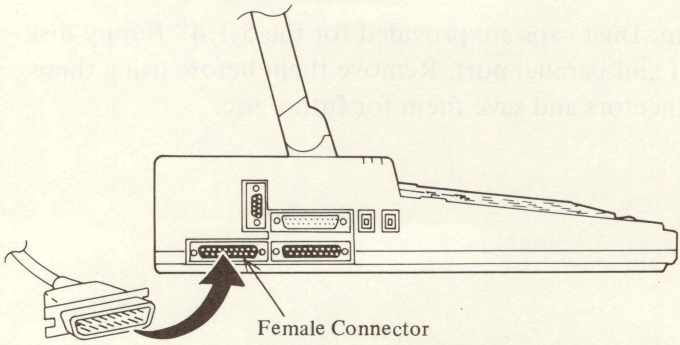
Left Side Panel

As shown in the following illustration, there are several connectors located on the left side panel. Let's look at each one, starting at the left side of the panel and moving to the right.

Note: Dust caps are provided for the 5-1/4" floppy disk port and parallel port. Remove them before using these connectors and save them for future use.



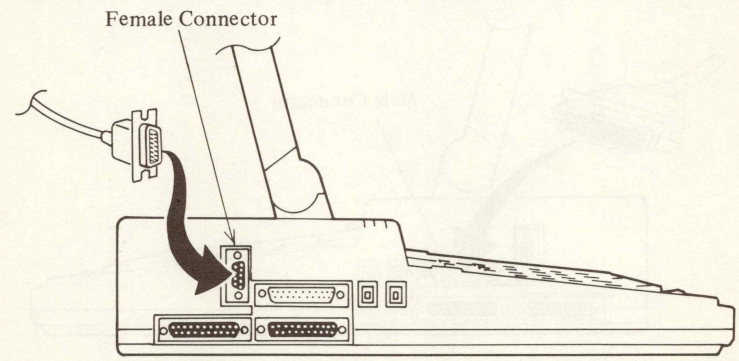
Parallel (Printer) Port. The first connector is the parallel port, used to connect parallel printers to the unit.



The end of the cable connected to this port must be a 25-pin male connector.

If you need detailed specifications for this port, turn to Appendices.

Color/Monochrome CRT Connector. The next connector is used to attach a color or monochrome CRT to your computer.

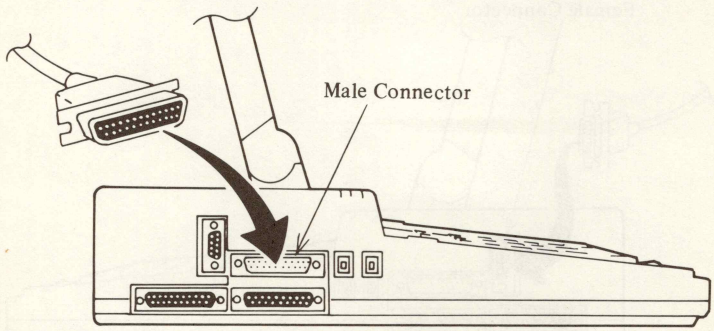


Note: A protective cap covers this slot until the CE-451A color/monochrome CRT adaptor is installed.

The end of the cable connected to this port must be a nine-pin male connector.

See Chapter 6 for more information about using a CRT with your system.

Serial (RS-232C) Port. The next connector is the serial RS-232C port. It is used to connect devices such as serial printers and external modems to the unit.

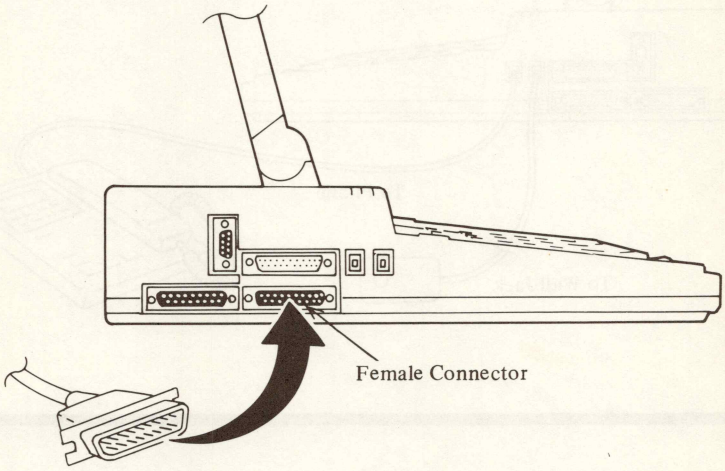


Note: A protective cap covers this port until the CE-451B serial I/O card or the CE-451M modem card is installed.

The end of the cable connected to this port must be a 25-pin female connector.

If you need detailed specifications for this port, see Appendices.

5-1/4" Floppy Disk Drive Unit Port. The next connector is the external floppy disk drive unit port. It is used to connect a 5-1/4" floppy disk drive unit to the computer.

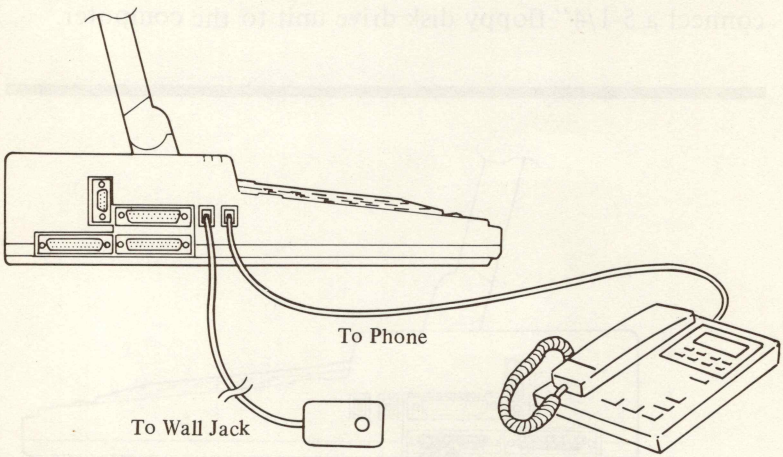


The end of the cable connected to this port must be a 25-pin male connector.

If you need detailed specifications for this port, see Appendices.

Modem Connectors. The next two sets of connectors are used to make telephone connections to the CE-451M modem card.

Note: Protective caps cover the slots where the modem connections are made. During modem installation, these caps are removed.



One connects a standard telephone line to the modem.
The other connects the telephone to the modem.
The two connectors are interchangeable.

Note: The wall jack must be one of the following standard connectors:

- USOC-RJ11W
- USOC-RJ12W
- USOC-RJ13W
- USOC-RJ11C
- USOC-RJ12C
- USOC-RJ13C

See Chapter 6 for information about using the CE-451M modem card with the system.

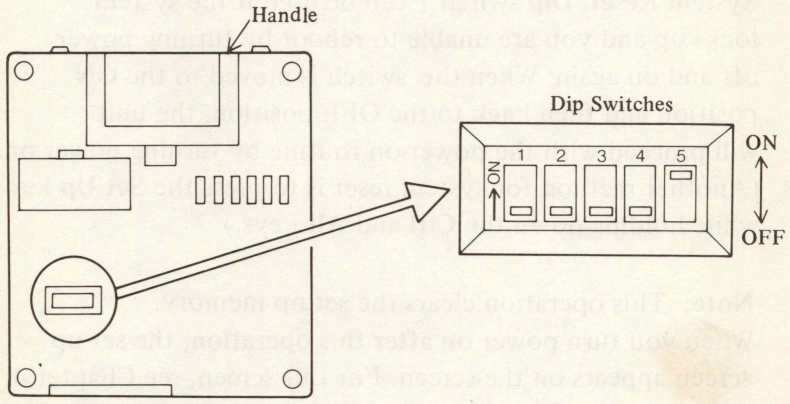
Let's look at the bottom panel.

Bottom Panel

On the bottom panel you will see a handle and some dip switches.

The dip switches are used to control the following functions by setting them to ON or OFF as specified.

- System reset
- Display mode select
- Speaker volume
- Speaker control



Each dip switch has two settings, ON and OFF. To set the dip switches, first put the computer face down.

Note: Remember to turn off power to the computer before setting dip switches. Dip switch settings do not take effect until the computer is turned back on.

To set any dip switch, push it using a ballpoint pen to the desired position:

The available dip switch settings are as follows:

Dip Switch Label	Feature	Setting		
1	System reset	ON: Reset OFF: Normal		
2, 3 (Combination)	Display mode select	2	3	
		ON	ON	Not used
		ON	OFF	40 x 25 Graphics adaptor
		OFF	ON	80 x 25 Graphics adaptor
		OFF	OFF	80 x 25 monochrome adaptor
4	Speaker volume	ON: Speaker volume LOW OFF: Speaker volume HIGH		
5	Speaker control	ON: Speaker ON. OFF: Speaker OFF.		

System Reset. Dip switch 1 can be used if the system locks up and you are unable to reboot by turning power off and on again. When this switch is moved to the ON position and then back to the OFF position, the unit will proceed with the power-on routine by turning power on. (Another method for system reset is to press the **Set Up** key while holding down the **Ctrl** and **Alt** keys.)

Note: This operation clears the set up memory. When you turn power on after this operation, the set up screen appears on the screen. For this screen, see Chapter 4.

Display Mode Select. Dip switches 2 and 3 are used in certain applications to identify the display mode. See Chapter 6 for more information on this feature.

Speaker Volume. Dip switch 4 enables you to control the speaker volume.

Speaker Control. Dip switch **5** enables you to turn the speaker off if desired.

Let's move on to the keyboard.

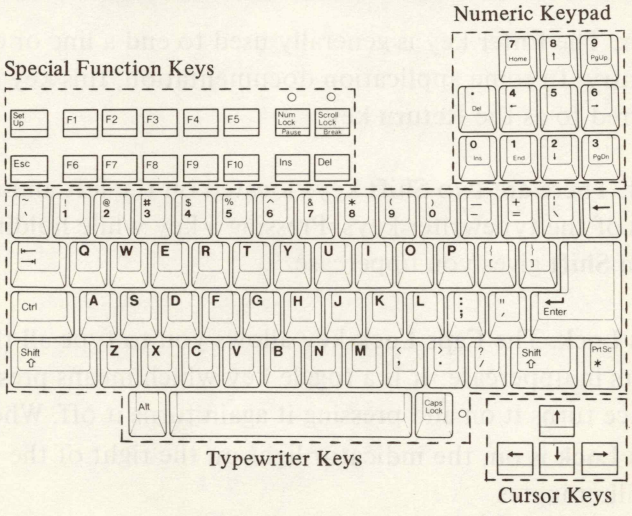
The Keyboard

The keyboard allows you to communicate with the main unit.

The description below provides an overview of keyboard usage. When using applications software, however, certain keys may take on different meanings.

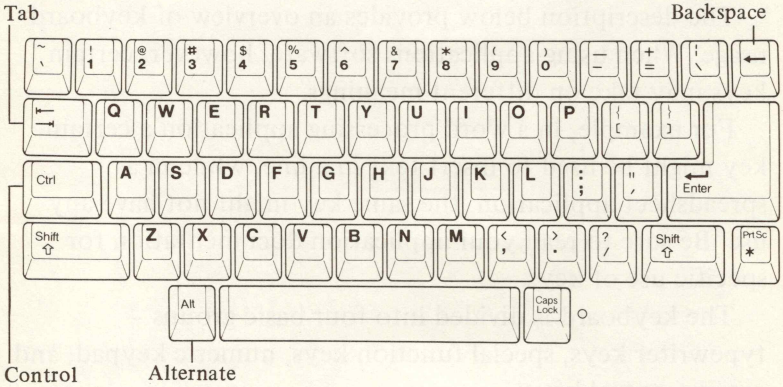
For example, in a word processing application a certain key might be used to insert text in a line, while in a spreadsheet application, the same key might not have any use. Be sure to read your application documentation for specific use of keys.

The keyboard is divided into four basic groups – typewriter keys, special function keys, numeric keypad, and cursor control keys.



Typewriter Keys

The typewriter keys are similar in function and appearance to those found on a standard typewriter. There are some keys in this group, however, that you might not be familiar with.



Enter. The **Enter** key is generally used to end a line or end an entry. In some application documentation, this key is referred to as the **Return** key.

Shift. There are two **Shift** keys located on the left and right sides of the typewriter keys. Pressing a key while holding down **Shift** gives you uppercase.

Caps Lock. The **Caps Lock** key allows you to type all the letters in uppercase. It is a toggle key which means pressing it once turns it on and pressing it again turns it off. When **Caps Lock** is on, the indicator light on the right of the key illuminates.

Caps Lock affects letter keys only. Shift is used when **Caps Lock** is on to type uppercase symbols and punctuation marks.

Shift also reverses the action of **Caps Lock** when typing letters. If you press **Shift** when the **Caps Lock** key is on and type a letter, you get a lowercase letter.

Tab. The **Tab** key works like the tab key on a regular typewriter. In certain applications, you can return to the last tab in a line by pressing **Tab** while holding down **Shift.**

Backspace. The **Backspace** key works like the backspace key on a typewriter, backing up one character position at a time. In some applications, **Backspace** erases characters as it backs up.

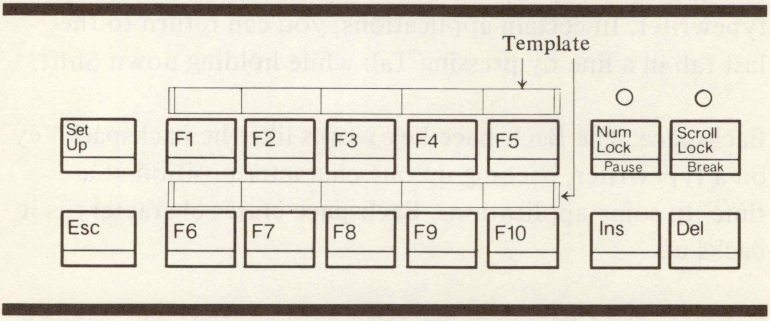
Control. The **Ctrl** key, when used with another key, sends a special instruction to the system. For example, in a word processing application, pressing **Ctrl** and **P** together might tell the system to stop printing a document.

Alternate. Like **Ctrl**, **Alt** provides an alternate function or accesses characters from the extended character set. (See "Character Set" in this chapter.)

Print Screen. Pressing **PrtSc** while holding down **Shift** prints whatever is on the screen. Pressing **PrtSc** alone results in an asterisk.

Special Function Keys

At the top of the keyboard are 10 function keys labeled F1 through F10 and 6 other keys as shown in the illustration below.



Function Keys. These keys perform editing functions in MS-DOS* and have application defined functions at other times. Refer to your application documentation for a description of these keys.

Note: Directly above the function keys are blank templates. You can write labels on the template to identify functions for each key.

Other Keys

Set Up. Pressing **Set Up** accesses the set up screen where you can define certain characteristics of the system. See Chapter 4 for more information about this screen.

Escape. The **Esc** key is frequently used in applications to cancel a command or exit the application.

Number Lock. The **NumLock** toggle key affects only the numeric keypad, allowing you to enter numbers using the numeric keypad.

When **NumLock** is on, pressing keys labelled 0 through 9 and decimal point results in a number. When **NumLock** is on, the **Shift** key can be used to activate the cursor control keys.

When pressed with **Ctrl, NumLock** suspends the system operation, pausing the display of text on the screen. To restart, press any key.

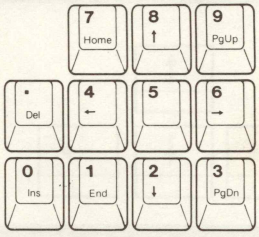
Scroll Lock. This key has no function when used alone. When pressed together with **Ctrl, Scroll Lock** provides a break function, stopping programs that are running.

Insert. The **Ins** key is used to insert text.

Delete. The **Del** key is used to delete text.

Numeric Keypad

To the right of the function keys is a numeric keypad.



Cursor Control. The keys labelled 1 through 9 can be used as an alternative to the typewriter number keys or as a way to control the movement of the cursor – the underline or block character that you move around the screen.

When the system is first turned on, these keys control the movement of the cursor. The arrow keys move the cursor up or down one line at a time and to the right or left one character at a time.

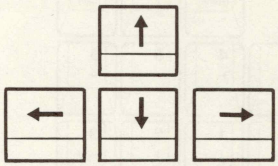
The **Home**, **PgUp**, **PgDn**, and **End** keys also move the cursor around the screen. In general:
The **Home** key moves the cursor to the upper left corner of the screen.
The **PgUp** key moves the cursor back one full screen.
The **PgDn** key moves the cursor ahead one full screen.
The **End** key moves the cursor to the last character in a file.

Insert. The **Ins** key is used to insert text. When used with **Shift**, the 0 can be accessed.

Delete. The **Del** key is used to delete text. When used with **Shift**, the decimal point can be accessed.

Cursor Control Keys

Beneath (to the right) of the typewriter keys are the cursor control keys.



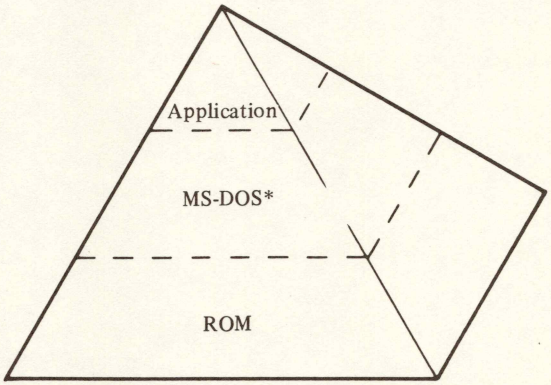
These keys control the movement of the cursor – the underline or block character that you move around the screen.

The arrow keys move the cursor up or down one line at a time and to the right or left one character at a time.

The Software

As you learned in Chapter 1, a computer system needs software to be useful. Without software, your computer is just a collection of electrical components.

In order to understand how software functions on the computer, think of it in three levels.



When power is turned on to the system, software and hardware begin to interact.

Software stored in ROM (read only memory) is installed into the computer at the factory. Sometimes referred to as firmware, it performs three basic functions when the system is first turned on:

- Checks performance of hardware components
- Determines what external devices (e.g., CRT, printer) are connected to the main unit
- Loads (reads) MS-DOS* from a diskette or the hard disk into main memory

Once MS-DOS* is loaded into main memory, you can enter various MS-DOS* commands.

You can also instruct MS-DOS* to load an application such as word processing into main memory. Chapter 4 describes in detail how to load and run an application.

The Diskettes

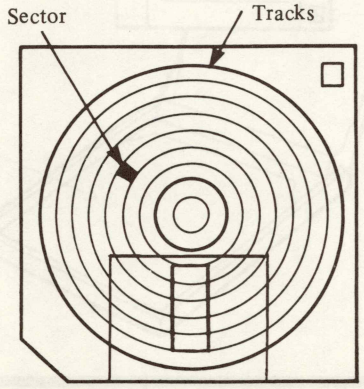
A diskette is a magnetic device that stores information created on a computer. Once information is stored on a diskette, it can be re-used whenever necessary or replaced when no longer needed.

The computer uses 3-1/2-inch, double-sided, double density diskettes that store up to 720K (approximately 720,000 characters) of information.

Diskette Format

In order for information to be stored on a diskette, the operating system must first prepare – format – the diskette. This process enables stored information to be easily located.

During formatting, the diskette is divided into 80 circular tracks, similar to those on a record.



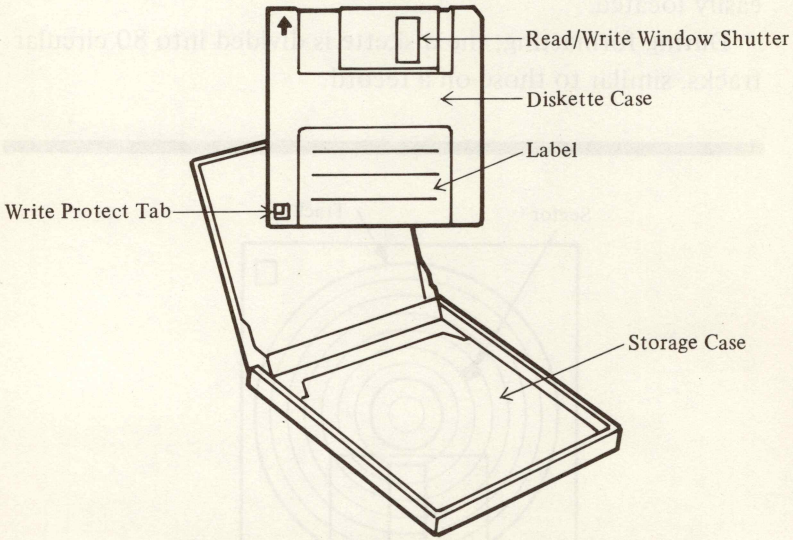
Each track is further divided into sectors that identify information stored within the track. The track number and sector number act like addresses to the computer, making access to information an automatic and rapid process.

During operation, the diskette rotates inside its protective jacket. As it rotates, the read/write head of the drive moves from one track to another, locating information or finding space available for new information. You need not be concerned where information is stored on a diskette. MS-DOS* will manage that function automatically.

Diskette Handling Procedures

To safeguard information stored on diskette, it is important that you handle diskettes with care.

The illustration below shows what a typical diskette looks like.



Storage Case. Some diskettes come with a storage case to protect the diskette. Return the diskette to its storage case after use.

Diskette Case. The diskette itself is permanently encased in a plastic jacket to protect its magnetic surface. This jacket can not be removed.

Label. The label identifies the content of the diskette. The label should be placed over the recessed area of the diskette.

Read/Write Window Shutter. The read/write window shutter allows the disk head to read from and write to the diskette.

Write Protect Tab. The write protect tab can be positioned to prevent changes to important files. To protect a diskette, slide the write protect tab to the open position; to allow the computer to write on the diskette, slide the tab to the closed position.

Follow these procedures when handling diskettes:

- Return the diskette to its storage case after use.
- Never bend or twist the diskette.
- Never expose the diskette to liquids. If you spill a liquid on the diskette, throw the diskette away.
- Never expose diskettes to excessive heat or direct sunlight.

- Always keep diskettes at least 3 meters (10 feet) away from magnetic fields such as those in electronic equipment and telephones.

- Always store diskettes in a cool, dry, dust free area, in an upright position.

- Never place heavy objects such as books on the diskettes.

The Hard Disk

The hard disk is a magnetic device fixed to the axis, and each side of the disk has a magnetic head to read/write information. The hard disk drive uses a fully integrated, floating head system externally isolated for operation, providing high speed, large capacity, and high reliability.

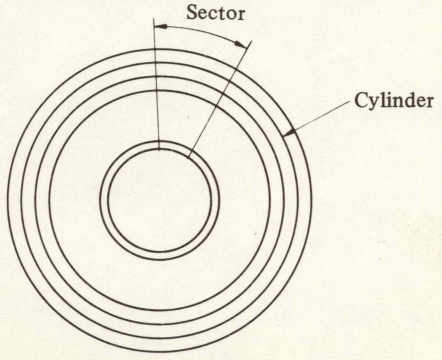
The PC-4521 contains a 3½-inch hard disk that stores up to 20 megabytes of information as standard.

Hard Disk Format

Like diskettes, the hard disk must first be formatted by the operating system in order to store information.

During formatting, the hard disk is divided into 614 cylinders. A cylinder is a collection of tracks in the same position on different sides of the hard disk(s).

Each cylinder is further divided into 17 sectors per side. Each sector holds 512 bytes of data. Read/write can be performed in sector units.



Hard Disk Drive Handling Procedures

The hard disk drive is a precision device that requires particular care in handling.

Follow these procedures when handling the PC-4521.

▲When you finish working with the hard disk, be sure to execute the HDTRNS command by typing HDTRNS at the MS-DOS prompt and pressing the Enter key. This command positions the hard disk heads where they will be least affected by vibration and shocks.

▲Do not subject the unit to vibration and shocks, especially during transportation.

▲Backup copies of all programs and data should be retained on floppy diskettes to prevent loss or damage in the event of disk or hardware failure. The data once lost can never be restored unless you have backup copies.

▲To move the unit to a temperature more than 10 degrees C (18 degrees F) different from its present location, first move it to a temperature difference of less than 10 degrees C (18 degrees F) for one hour, then gradually increase or decrease the temperature.

Character Set

The following table shows the character set along with decimal and hex codes.

DECIMAL VALUE ➡		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
⬇ HEX DECIMAL VALUE		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	BLANK (NULL)	►	BLANK (SPACE)	0	@	P	‘	p	Ç	É	á	▒	└	╨	α	≡
1	1	☺	◄	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2	2	☻	↕	“	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4	4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	6	♠	▬	&	6	F	V	f	v	å	û	ª	╢	╞	╓	μ	÷
7	7	•	↨	’	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	•
10	A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
11	B	♂	←	+	;	K	[	k	{	ï	¢	½	╗	╦	■	δ	√
12	C	♀	∟	,	<	L	\	l	¦	î	£	¼	╝	╠	▄	∞	n
13	D	♪	↔	—	=	M	]	m	}	ì	¥	¡	╜	═	▌	φ	²
14	E	♫	▲	.	>	N	^	n	~	Ä	Pt	«	╛	╬	▐	∈	■
15	F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	┐	╧	▀	∩	BLANK (FF)

Note: Some of the characters in the character set (32 to 126 and 128 to 255) can be entered in the MS-DOS command line. To enter the character, type its decimal code while holding down the **Alt** key.
When you release the **Alt** key, the character will be displayed on the screen.

Using the Computer

Overview	4-1
System Start-up	4-3
Set Up Functions	4-17
Running an Application	4-25

Overview

This chapter describes how to use the resources of the computer to accomplish your computing needs.

The first section describes system start-up procedures.

The second section shows how to use the set up functions.

The third section describes how to run an application such as word processing or spreadsheets on the computer.

System Start-up

To start up the system, begin by locating the MS-DOS* diskette supplied with the computer and remove it from its storage case.

Next, do the following:

1. Insert the MS-DOS* Master diskette into floppy disk drive A.

2. Turn on power to the main unit. The system will go through its internal check procedures and display the following text on the screen:

```
The Sharp Personal Computer System
Firmware Version x.xx
Copyright (C) 1987 by Sharp Corporation
Copyright (c) 86, 87 by Vadem, Inc.

Processor      Passed.
Firmware ROM   Passed.
Keyboard       Passed.
Clock          Passed.
Setup RAM      Passed.
xxxK Memory.

Loading A:
```

Note: If you are using the computer for the first time or just replaced the battery, turning power on to the main unit displays the set up screen. For details about this screen, see the next section. If the system does not power on or the screen displays garbage, reset the system using dip switch 1 on the bottom panel. For this setting, see Chapter 3.

3. After a few seconds, the system begins to load MS-DOS* from the floppy diskette in drive A into main memory. Once MS-DOS* is loaded, the following message displays indicating that the system has started up (sometimes called "booted"):

```
The Sharp Personal Computer System
I/O Subsystem Version x.xx
Copyright (C) 1985, 1986, 1987 by Vadem Inc.
All Rights Reserved.

A>PATH \

A>VER

MS-DOS Version 3.21

A>
A>
```

Copying MS-DOS*

It is recommended that you make a copy of the MS-DOS* diskette in drive A. The diskette supplied with the system becomes your backup and the second diskette becomes your working copy.

To copy the MS-DOS* diskette in drive A, do the following:

- **For users of the PC-4502**

1. Insert a blank diskette in drive B.

2. Enter the command shown below, then press Enter. (Remember, your entries are shaded in this manual.)

Note: MS-DOS* commands such as DISKCOPY can be typed in lowercase or uppercase. Be sure to leave one blank space between the command and the letter A and a space between the first colon and the letter B. Don't forget to press **Enter** after it has been typed.

```
A>DISKCOPY A: B:

Insert SOURCE diskette in drive A:

Insert TARGET diskette in drive B:

Press any key when ready ...

Copying 80 tracks
9 Sectors/Track, 2 Sides

Formatting while copying

Copy another diskette (Y/N)?
```

3. After the DISKCOPY command is entered, the system instructs you to insert the source diskette in drive A and the target diskette in drive B. The system then instructs you to strike any key to begin the copying.

   Since the MS-DOS* diskette is already in drive A and the blank diskette in drive B, simply press any key on the keyboard.

   Once you press any key, the system begins copying while formatting the diskette in drive B if not formatted.

4. When copying is completed, the system asks if you want to copy another diskette. Enter N.

5. The next step is to enter the DISKCOMP command as shown below. This is done to insure that the copy was successful.

```
A>DISKCOMP A: B:

Insert FIRST diskette in drive A:

Insert SECOND diskette in drive B:

Press any key when ready ...

Comparing 80 tracks
9 sectors per track, 2 Sides

Compare OK

Compare another diskette (Y/N)?
```

6. As with DISKCOPY, simply press any key to start the comparing.

   If the two diskettes do not compare properly, error messages appear. Perform the DISKCOPY again.

7. Once the DISKCOMP is completed, the system asks if you want to compare more diskettes. Enter N.

   Remove the MS-DOS* diskette from drive A and store it in a safe place. Next, remove the diskette from drive B and label it using a felt tip pen.

   You can then place the diskette from drive B into drive A to continue, or you can turn off the system.

- **For users of the PC-4521**

1. Enter the command shown as follows, then press **Enter**. (Remember, your entries are shaded in this manual.)

Note: MS-DOS* commands such as DISKCOPY can be typed in lowercase or uppercase. Be sure to leave one blank space between the command and the letter A and a space between the first colon and the second A. Don't forget to press **Enter** after it has been typed.

```
A>DISKCOPY A: A:

Insert SOURCE diskette in drive A:

Press any key when ready ...

Copying 80 tracks
9 Sectors/Track, 2 Sides

Insert TARGET diskette in drive A:

Press any key when ready ...

Formatting while copying

Insert SOURCE diskette in drive A:

Press any key when ready ...

Insert TARGET diskette in drive A:

Press any key when ready ...

Insert SOURCE diskette in drive A:

Press any key when ready ...

Insert TARGET diskette in drive A:

Press any key when ready ...

Copy another diskette (Y/N)?
```

2. After the DISKCOPY command is entered, the system instructs you to insert the source diskette in drive A. Since the MS-DOS* diskette is already in drive A, simply press any key on the keyboard. Once you press any key, the system begins reading the contents of the diskette in drive A.
3. When reading is completed, the system instructs you to insert the target diskette in drive A. Replace the diskette in drive A with a blank diskette and press any key on the keyboard. The system begins writing the contents read from the source diskette while formatting the diskette, if not formatted. The computer repeats steps 2 and 3.

   Note: If your computer's memory is expanded, the diskette copy may be completed with less diskette exchange operation.

4. When writing is completed, the system asks if you want to copy another diskette. Enter **N**.

5. The next step is to enter the command as shown below. This is done to insure that the copy was successful.

```
A>DISKCOMP A: A:
Insert FIRST diskette in drive A:

Press any key when ready

Comparing 80 tracks
9 sectors per track, 2 Sides

Insert SECOND diskette in drive A:

Press any key when ready

Insert FIRST diskette in drive A:

Press any key when ready

Insert SECOND diskette in drive A:

Press any key when ready

Compare OK

Compare another diskette (Y/N)?
```

6. Replace the diskette in drive A with the MS-DOS* diskette, and simply press any key on the keyboard. The system then begins reading the contents of the diskette.

7. When reading is completed, the system instructs you to insert the second diskette in drive A. Replace the diskette with the one onto which you have copied the MS-DOS* diskette, and press any key. The system begins comparing the contents of the diskette with that of the MS-DOS* diskette. The computer repeats steps 6 and 7, this time first reading the second diskette then comparing it with the first diskette.

   Note: If your computer's memory is expanded, the diskette comparison may be completed with less diskette exchange operation.

If the two diskettes do not compare properly, error messages appear. Perform the DISKCOPY again.

8. Once the DISKCOMP is completed, the system asks if you want to compare more diskettes. Enter **N**.

Store the MS-DOS* diskette in a safe place. Next, remove the diskette from drive A and label it.

You can then return the diskette into drive A to continue, or you can turn off the system.

Using the Hard Disk (PC-4521)

As with the floppy diskette, the hard disk must be formatted in order to be used with MS-DOS*. Before formatting, however, the hard disk requires a special process to prepare the MS-DOS* area on the hard disk.

The hard disk can be divided into up to four separate areas (partitions). Each partition is assigned to an operating system.

When you use the hard disk for the first time, no partition is assigned to the hard disk. You can create only one MS-DOS* partition in the hard disk using the MS-DOS* FDISK command.

Preparing the Hard Disk for Use

The MS-DOS* hard disk preparation program (FDISK) is used to create, change, or erase the MS-DOS* partition. You can treat only the MS-DOS* partition with the FDISK command. Other partitions will be created, changed, or erased by the other operating system's hard disk preparation program.

You can create one MS-DOS* partition on a hard disk at the location and of the size you desire.

The following procedure sets the entire hard disk to the MS-DOS* partition and then formats it:

1. Insert the MS-DOS* diskette in floppy disk drive A and turn on power to the computer.

2. When the system has started up and the MS-DOS* prompt (A>) appears, enter the FDISK command and press the **Enter** key. The following display appears:

```
Fixed Disk Setup Program Version x.xx
(C) Copyright Microsoft. 1985-1987.

FDISK Options

Choose one of the following:

  1. Create DOS Partition
  2. Change Active Partition
  3. Delete DOS Partition
  4. Display Partition Data


Enter choice:[1]

Press ESC to return to DOS
```

3. Simply press the **Enter** key, then the display changes to the following:

```
Create DOS Partition

Do you wish to use the entire fixed
disk for DOS (Y/N)..... ? [Y]
```

4. After entering Y and pressing the **Enter** key, the following message will be displayed.

```
System will now restart
Insert DOS diskette in drive A:
Press any key when ready ...
```

By pressing any key, MS-DOS* will reboot. This is done so as to recognize the hard disk.

5. After the MS-DOS* prompt (A>) appears, execute the FORMAT command to match the hard disk format with that of MS-DOS*. The hard disk is referred to as drive C when you are using the standard system and as drive D when the external floppy disk drive is attached.

   Note: All data in the MS-DOS* partitions is destroyed once formatting starts.

   Example:

```
A>FORMAT C:/S/V

WARNING. ALL DATA ON NON-REMOVABLE DISK
DRIVE C: WILL BE LOST!
Proceed with Format (Y/N)? Y

Format complete
System transferred

Volume label (11 characters. ENTER for none)? HARDDISK
```

   When formatting is completed, the available hard disk memory capacity is displayed and the system returns to MS-DOS*.

6. Now confirm whether MS-DOS* starts up automatically from the hard disk by either turning the computer off and then on again, or by restarting it. System restart is performed by pressing the **Del** key while holding down the **Ctrl** and **Alt** keys at the same time.
   When you do this, make sure drive A is not locked, because the computer attempts to load MS-DOS* from drive A if drive A is locked.

File Transfer to Hard Disk

This section explains how to transfer files from a diskette to the hard disk. In the following example, the contents of the MS-DOS* diskette are transferred.

1. Insert the MS-DOS* diskette in drive A.

2. Type COPY A: \ *.* C: \ *.* and press the **Enter** key to duplicate all files stored on the MS-DOS* diskette.

   With this, the contents of the MS-DOS* diskette are completely duplicated on the hard disk.

Making Backup Copy of Hard Disk

The hard disk can store a number of programs and a great quantity of data. However, since it is possible to destroy the data by dropping or otherwise damaging the disk, Sharp recommends that you make a backup copy of the hard disk.

Procedures for making a backup copy of all files stored in the MS-DOS* area of the hard disk are explained below.

1. Determine the total size of the files that you want to copy. The number of diskettes necessary for backup is calculated as follows:

   (Hard disk total capacity) / (Floppy diskette capacity)

   For example you will need about 30 blank diskettes to back up the 20 megabytes of information (20480/720 ≒ 29).

2. Format all blank diskettes using the FORMAT command. As you format them, place labels numbered from 1 to XX on these diskettes.

3. Start up MS-DOS* using the MS-DOS* diskette and enter the following when the MS-DOS* prompt (A>) is displayed.

   BACKUP C: A:

   Then press the **Enter** key. The following message appears:

```
Source disk is Non-removable

Insert backup diskette 01 in drive A:

Warning! Files in the target drive
A: \ root directory will be erased
Strike any key when ready
```

   Insert diskette No. 1 in drive A and press any key to start the backup operation.

4. When the available area in the inserted diskette becomes full, the message shown in step 3 reappears, this time asking for diskette No. 2. When this occurs, remove diskette No. 1 and insert blank diskette No. 2 in drive A. Then, press any key to continue.

5. When you have completely copied all files on the hard disk, the system returns to MS-DOS*, indicating the backup operation has terminated. Be sure to keep your backup diskettes in a safe place.

Restoring Contents of Hard Disk

Procedures for restoring contents of the hard disk using the backup diskettes are described below.

1. Start up MS-DOS* using the MS-DOS* diskette and enter the following when the MS-DOS* prompt (A>) is displayed:

   RESTORE A: C:/P

   Then press the **Enter** key. The following message appears:

```
Target is Non-Removable

Insert backup diskette 01 in drive A:
Strike any key when ready
```

   Insert diskette No. 1 in drive A and press any key to begin the restore operation.

   CAUTION: If you have updated files on the hard disk, the backup files will no longer be the same. If you choose to restore the backup file, your updated file will be destroyed.

2. When the contents of backup diskette No. 1 have been completely transferred to the hard disk, the message in step 1 reappears, this time asking for backup diskette No. 2. Repeat the restore operation for this and the rest of the backup diskettes.

3. After all files have been transferred from the backup diskettes, the MS-DOS* prompt (A>) is displayed.

System Restarts

In certain instances, you may want to return the system to its start-up state – with only MS-DOS* in memory. For example, this can be used when a new application program diskette is inserted in drive A.

This procedure is called restart (sometimes called "warm boot").

CAUTION: Any information in main memory will be lost when this procedure is performed. Be sure to do a file save first.

To perform this procedure, press and hold down the **Ctrl**, **Alt**, and **Del** keys simultaneously, then release. The system reacts as if power was just turned on, except that it by-passed an internal check.

If your system has no hard disk and there is no diskette in drive A or if the diskette in drive A does not contain MS-DOS*, the system displays an error message similar to this:

```
Loading A: ... Error !

Diskette Drive Empty...
Please Insert a System Disk and Press any Key:_
```

If this occurs, insert a diskette containing MS-DOS* in drive A, then press any key.

The system can be restarted under most operating conditions.

If a situation occurs where you are unable to restart the system with this procedure, turn power off to the computer, wait five seconds, then turn power on, or perform a system reset by:

- pressing **Ctrl/Alt/Set Up**

or

- setting dip switch 1 on the bottom of the unit to the ON and then OFF position.

See Chapter 3 for further information.

Set Up Functions

The computer allows you to customize the configuration of your system through the functions on the set up screen.

Note: This screen provides an alternative to the MS-DOS* DATE, TIME, and MODE commands.

Accessing Set Up

Once your system is turned on, you can access these configuration settings by pressing the **Set Up** key located in the upper left corner of the keyboard.

Note: When you are running an application, the set up function may not be accessable. If this occurs, exit the application, then press **Set Up**. In some rare cases, the application will not accept the settings specified by the set up function.

Here's what the standard set up screen looks like:

```
        SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)

------- Clock ---------------   ----Communication---  ------ Printer --------
Time: 03:16:54                  COM1: Not Present     Interface:     Parallel
Date: Sat March 21, 1987        COM2: Not Present     Port Address:      3BCh

------- Power ---------------
On Condition:   None

------- Display -------------                         ------ System ---------
Display Mode:       Graphics                          Speed:          Standard
Cursor Blink:       2/second                          Key Click:           Off
Cursor Type:        Underline                         Console:             CGA
Character Blink:    1/second                          Drive A:  Internal 3.5"
Background:         Standard
Backlight:          On
Backlight Timeout:  2 minutes                         Default Setup:       F1


 1. Position cursor          2. Press Spacebar        3. Press Set Up key
    using cursor keypad         to change                to Update and Exit
```

This screen displays six set up function categories – clock, power, display, communication, printer, and system – with the default settings for each field. Default means the setting that the system assumes unless you tell it otherwise.

If you have installed the CE-451M modem card, CE-451B serial I/O card, or CE-451A CRT adaptor, additional categories display. See Chapter 6 for more information about these settings.

Making Selections

When you first access this screen after turning on the computer, the cursor is positioned in the first field. There are several ways to move the cursor from field to field on this screen.

To move forward through each field, use the **Right Arrow** or **Down Arrow** key. To move backward through each field, use the **Left Arrow** or **Up Arrow** key.

Once you are in a field, press the **Space Bar** to cycle through the possible settings for the field. Once the desired setting appears, go to another field or press **Set Up** to exit the screen.

If you change any settings, then decide you want to return all fields to their default settings, press the **F1** key. The system then restores all fields, except date and time, to their default settings.

When you press **Set Up** to exit the screen, the system saves your entries.

If you changed a setting that requires system restart, the system prompts you to press **Enter** after pressing the **Set Up** key.

When you press **Esc**, the system exits the set up screen without saving your entries.

Note: A limited number of keys are active in the set up screen. A beep will sound if you press any key other than those described above.

The set up screen is backed up by lead battery. All selections are maintained even when power is turned off. If the system is stored for an extended period of time, however, it may be necessary to reset the values. For recharging battery, see "AC Adaptor Connection" in Chapter 3.

The following is a description of each field.

Clock

The computer contains a battery operated clock that keeps track of the time and date. When you first purchase the system, the current time and date must be set.

Time. This field is divided into three parts – hours, minutes, and seconds. Time is set in a 24-hour clock format. For example, 6 p.m. would be 18 hours.

Date. This field is divided into three parts – month, day, and year. The day of the week (i.e., Mon, Tue, Wed, etc.) is set automatically after the month, day, and year have been entered.

Note: This is equivalent to entering the DATE and TIME commands in MS-DOS*.

Power

This category contains the setting for power control. Power is usually turned on and off by pressing the ON/OFF button provided at the right side panel.

If you select Alarm in the On Condition field and specify time in the next field, power is automatically turned on to the computer when the specified time comes.

On Condition. The possible settings are: None or Alarm.

Alarm Time. This field appears when you select Alarm in the On Condition field. Specify the alarm time in the same format as Time in the Clock category.

Note: If you have installed the CE-451M modem card, additional selections can be made. See Chapter 6 for more information about these settings.

Display

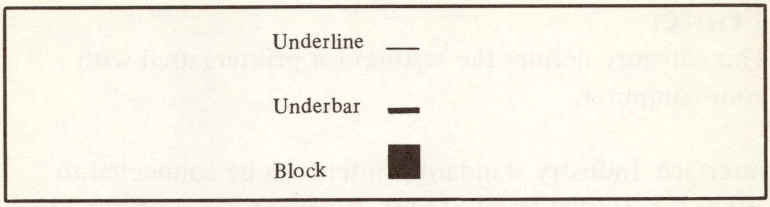
This category contains the settings that control the screen. These settings have no effect on a CRT connected to the system except for the cursor type.

Display Mode. Certain applications require the screen to operate in graphics or monochrome mode. The display mode can be set to emulate a color/graphics adaptor or monochrome adaptor.
The possible settings are: Graphics, or monochrome.

Note: Display mode only controls the computer's screen – it does not control a CRT connected to the system. For the mode setting for a CRT, see Chapter 6.

Cursor Blink. The cursor blink rate is the number of times per second that the cursor blinks on the screen. Possible settings are: No Blink, 1/second, 2/second, or 4/second.

Cursor Type. The cursor's appearance can be changed. The possible settings are: Underline, Underbar or Block.



Character Blink. Some applications cause characters to blink on the screen. For example, in word processing, an entire word might blink if it is spelled incorrectly. The possible settings are: 1/second, 2/second, or 4/second.

Background. The screen background can be set to display in standard – dark characters on a light background – or inverse – light characters on a dark background. The possible settings are: Standard or Inverse.

Backlight. The screen's backlight can be turned on or off. The possible settings are: On or Off.

Backlight Timeout. After a certain period in which no keys are pressed, the system automatically shuts off the backlight. You can determine the approximate length of this timeout period or allow the backlight to stay on continuously. The possible settings are: Always On, 2 minutes, 5 minutes, or 10 minutes.

Communication

This category contains the settings allowing you to define the use of two channel (COM1, COM2) communication ports for the internal modem or internal SIO.

Note: Only one of the two settings, Internal Modem or Internal SIO, can be supported. For details, see Chapter 6.

Printer

This category defines the settings for printers used with your computer.

Interface. Industry standard printers can be connected to either the parallel or serial port. If a printer is connected to the parallel port, select parallel. If a printer is connected to the serial port, select serial. The possible settings are: Serial or Parallel.

Port address. The port address parameter allows you to change the printer port address to match the address used by your software application. In the vast majority of applications, the default address, 3BCH should be used.

3BCH: Represents the port address of the parallel port on the IBM* monochrome display and printer adaptors. This address is used by most applications.

378H: Represents the address of another parallel port. Some applications may be written to directly address this port. Try this address when your application does not address the default port address.

System

There are five miscellaneous fields in this category.

Speed. This field determines the speed of the processor. The standard processor can run at an efficient 7.16 MHz or at a slower speed required by some applications. The possible settings are: Standard or Slow.

Key Click. This field is for click On/Off setting. If this setting is ON, you hear a click whenever you press any key. The possible settings are: On or Off.

Console. This field determines which display type becomes the system console upon boot when the optional CRT adaptor is attached.

Since the liquid crystal display or the CRT can be either monochrome or color graphics, this selection tells the system which display should be the console. The display console can also be changed by using the MODE command. The possible settings are: CGA (color graphics adaptor) or MDA (monochrome display adaptor).

Note: The set up screen appears only on the console which is in the same display mode as specified in this field.

Drive A. This field is used to assign Floppy Disk Drive A to Internal 3-1/2" FDD or External 5-1/4" FDD. If External 5-1/4" is selected, DOS can be run from 5-1/4" diskette. The possible settings are: Internal 3.5" or External 5.25".

Default. If you change any fields on this screen, then decide you want to return all entries to the default values, press the **F1** key in any field. Time and date are not affected.

Running an Application

The computer allows you to run a wide variety of application software. This section provides a general overview of the steps involved in installing and running an application on the system.

In general, application software must be installed before it can be used. Installation procedures vary greatly from one application to another depending upon such factors as software copy protection, hardware options, etc.

In order to properly install a specific application, follow the instructions provided with the software.

To illustrate a typical session, we will describe sample procedures for running a word processing application. These steps provide a conceptual overview only.

Note: MS-DOS* commands that are discussed in this chapter are described in more detail in Chapter 5.

Getting Started

In this example, the word processor is supplied on two diskettes:

- Master word processing diskette
- Master spell checker diskette

The master word processing diskette contains the word processing software. The master spell checker diskette contains the spell checker software. Since neither of these diskettes contain MS-DOS*, they could not be used to start up – or boot – the system.

The steps to follow when installing an application on floppy diskettes and on the hard disk are substantially different.

Using Two Disk Drives (PC-4502)

Before running our example word processor, two steps must be completed:

1. Create boot diskettes.
2. Create data diskettes.

Create Boot Diskettes. We need to create two new diskettes. One diskette will contain MS-DOS* plus the word processing software. The other will contain MS-DOS* plus the spell checker software.

The following is an example of how to create a boot diskette.

1. Insert your working copy of MS-DOS* in drive A and a blank (or re-usable) diskette in drive B.
2. Turn power on to the system. (If the power is already turned on and you are in MS-DOS*, you can press **Ctrl/Alt/Del** to restart the system.)
3. Once the MS-DOS* prompt appears (A>), enter the command shown below:

```
A>FORMAT B:/S
```

This will format and copy MS-DOS* to the blank diskette in drive B.

4. Remove the MS-DOS* diskette in drive A and replace with the master word processing diskette.

5. Enter the command shown below.

```
A>COPY A:*.* B:
```

This will copy all the files from the diskette in drive A to the target diskette in drive B.

6. Once this process is completed, remove the diskette and label it as the word processor boot diskette.

The same process would be followed for creating the spell checker boot diskette.

The boot diskettes are now created. In the process, the master diskettes can now be stored in a safe place as backups.

Create Data Diskette. There is one last step to perform before the application can be used. A data diskette needs to be created for the permanent storage of files created in word processing.

The following is an example of how to create a data diskette.

1. Insert your working copy of MS-DOS* in drive A.

2. Insert a blank (or re-usable) diskette in drive B.

3. Enter the command shown below.

```
A>FORMAT B:
```

This prepares – or formats – a blank diskette in drive B to store files created by the word processor.

Using the Hard Disk (PC-4521)

It is assumed you have already prepared the hard disk for use. If not, prepare it referring to "Preparing the Hard Disk for Use" in the "System Start-up" section in this chapter.

Before describing how to install the application on the hard disk, we must discuss the concept of "directory".

A directory is a group of files. At the time of power on, you are in the directory called "root directory". You can create subdirectories under the root directory, and also you can create subdirectories under each subdirectory. In this way, you can construct a "tree" structure of directories on a diskette or hard disk.

Directories are convenient when you have a lot of files and want to store them into several groups. For details, see chapter 5.
The following is an example of how to install an application in a subdirectory on the hard disk.

1. With no diskette in drive A, turn power on to the system. (If the power is already turned on and you are in MS-DOS*, you can press **Ctrl/Alt/Del** to restart the system with no diskette in drive A.)

2. Once the MS-DOS* prompt appears (C>), enter the command shown below:

   Note: When using the external floppy disk drive, the MS-DOS* prompt will be "D> ".

```
C>CHDIR \
```

This command takes you back to the root directory if you are not there so that you can create a subdirectory for the application under the root directory. Please note that "\" means the root directory.

3. Next, enter the command shown below:

```
C>MKDIR WP
```

This will make a subdirectory named "WP" under the root directory.

4. Enter the command shown below:

```
C>CHDIR WP
```

This will take you to the new subdirectory "WP".

5. Insert the master word processing diskette in drive A. Then enter the command shown below:

```
C>COPY A:*.*
```

This will copy all the files from the diskette in drive A to the hard disk.

The same process would be followed for creating the spell checker boot diskette.

The word processing application is now installed on the hard disk. In the process, the master diskettes can now be stored in a safe place as backups.

The data files can be created on the hard disk, so you need not create a data diskette.

Using the Application

Using Floppy Disk Drives

You now are ready to use the application.

Suppose you now want to write a memo to your sales staff on the word processor. Here's what to do.

1. Insert the word processing boot diskette in drive A.

2. Insert the data diskette in drive B.

3. If the system's power has been turned off, turn on the power.

4. Once MS-DOS* is loaded from the boot diskette in drive A, you can enter a command – defined by the system – to start the application. In our example, this command is the following:

```
A>WP
```

The application is then read into main memory. Once fully loaded, the application software displays on the screen. You can then follow the application software's documentation to complete the desired task – in this case, create a memo.

Once the memo is created, it is saved through the application onto a data diskette in drive B. The memo can then be printed, retrieved for future editing, or sent via the modem to another computer.

When finished with the word processor, the system returns you to MS-DOS* where you can load another application, use MS-DOS* commands, or remove the diskettes and turn off the system.

Using the Hard Disk

1. With no diskette in drive A, turn on the power.

2. Once MS-DOS* is loaded from the hard disk, you can change the directory to the one you have created for the application. In our example, enter as follows:

```
C>CHDIR WP
```

3. Enter a command defined by the system to start the application. In our example, this command is the following:

```
C>WP
```

The application is then read into main memory. Once fully loaded, the application software displays on the screen. You can then follow the application software's documentation to complete the desired task – in this case, create a memo.

Once the memo is created, it is saved through the application in the data file in the hard disk. The memo can then be printed, retrieved for future editing, or sent via the modem to another computer.

When finished with the word processor, the system returns you to MS-DOS* where you can load another application, use MS-DOS* commands, or turn off the system.

Backing Up Data

- **Using Floppy Disk Drive**

When important files have been created on a data diskette, the diskette should be copied to insure that data is not lost if something should happen to the diskette.

This process is called backing up your data. It is performed by using the DISKCOPY command. See Chapter 5 for more information about this command.

- **Using the Hard Disk**

When important data files have been created on the hard disk, they should be copied onto a diskette to insure that data is not lost if something should happen to the hard disk.

This process is called backing up your data. It is performed by formatting a blank diskette using the FORMAT command and then backing up the files using the BACKUP command. See chapter 5 and the optional MS-DOS* manual for more information about these commands.

Device Indicator

When installing applications software, you may be asked to identify the type of hardware being used. If specific selections for this computer are not listed, you may select other hardware settings that provide similar features. Use the following guidelines when making these selections:

Display. When identifying the display, select IBM* color/graphics adaptor mode (when in Graphics mode) or IBM* monochrome display adaptor mode (when in Monochrome mode).

Keyboard. When identifying the keyboard, select IBM* PC layout.

Optional Color Monitor. When identifying the color monitor, select 640 x 200 two-color black and white mode or 320 x 200 four-color mode.

Optional Monochrome Monitor. When identifying the monochrome monitor, select IBM* monochrome display adaptor mode.

CE-451M Modem. When identifying the CE-451M modem, the closest selection is Hayes Smartmodem 1200*.

In some cases, more than one suitable selection may be available. It may be necessary to experiment with these settings to determine the best choice.

Operating Addendum

In a limited number of cases, when installing or running application software, it may be necessary to follow some special operating procedures.

The following guidelines are supplied for your use.

System Files on the DOS diskette. In certain cases it may not be possible to transfer the system files from the DOS diskette onto a program diskette using the SYS command. If this occurs, do not attempt to create a bootable diskette; instead, load the DOS diskette in drive A then remove, and place the program diskette in drive A.

Even when you succeed in creating a bootable diskette, do not attempt to transfer system files on the bootable diskette to another diskette using the SYS command or using the FORMAT command with the /S option.

Cursor Type and Blink Rate. The computer allows you to select underline, underbar, or block cursor types as well as cursor blink rate for the illuminated crystal display. Certain application software, however, does not support changes to cursor type or blink rate and will either ignore those settings in the set up menu or cause unpredictable results on the display.

Aspect Ratio. Graphics, e.g., a circle, on the CRT display will appear slightly elongated in the horizontal direction when displayed on the illuminated crystal display. This is because the aspect ratio of the illuminated crystal display differs from that of the CRT display.

System Reaction When Running Application. In some rare cases when running certain application programs, the ON/OFF button and/or the key lock indicators may react slowly. If the ON/OFF button does not function at all, return to MS-DOS*, then press the button again. If the problem continues, execute the system reset by pressing the **Set Up** key while holding down the **Ctrl** and **Alt** keys.

More on MS-DOS*

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MS-DOS* Prompt	5-9
MS-DOS* Commands	5-13

Overview

This chapter is an introduction to the operating system software – MS-DOS*. It provides you with enough information to perform basic MS-DOS* file management activities. For more complete description of MS-DOS*, see the optional MS-DOS* manual.

The first section describes the role of files in MS-DOS*.

The second section defines some basic keyboard rules when using MS-DOS*.

The third section describes the MS-DOS* prompt.

The fourth section describes some common MS-DOS* commands.

Files

In addition to managing system resources, the MS-DOS* operating system manages files created on the computer.

What are Files?

A file is related information created on the computer and saved on a diskette or hard disk for future use.

Typically, files are created through the use of application programs. For example, in a word processing application, you may create a file that contains a letter to prospective clients. Similarly, a spreadsheet application may be used to create a cash flow analysis.

Files created through applications are usually referred to as data files since they contain information – or data.

How are Files Used?

Once a file is created, it is identified by a file name and saved on a floppy diskette or hard disk.

At a later time, the file can be retrieved and edited to reflect changes, sent to the printer to create a paper copy, or sent to the modem for transmission to another computer via telephone lines.

For the most part, you create, name, save, and retrieve files through the application software which actually instructs MS-DOS* to perform these tasks.

Certain file management activities are handled directly through MS-DOS*. For example, suppose you have saved several spreadsheets on a diskette, and now want to make a copy of the diskette for backup. The MS-DOS* command DISKCOPY is used to perform this task.

Naming Files

Files must be identified by a unique name before they can be saved on a diskette or hard disk. Let's cover a few important MS-DOS* requirements for naming files.

First, a file name generally has two parts – the name and the extension.

The name typically identifies the file. For example, MEMO could be the name of a word processing file containing a memo.

The extension typically categorizes the file. For example, the MEMO file might have the extension DOC to indicate that the file is a document. The file extension is optional; however, it is useful for identifying files in the same category.

The name and extension are separated by a period (e.g., MEMO.DOC). If an extension is used, it becomes a permanent part of the file name.

The name can be up to eight characters and the extension up to three characters.

Note: All files stored in the same directory on a diskette or hard disk must have unique names.

Acceptable Characters. The following are acceptable characters in file names:

Any letter in the alphabet. MS-DOS* makes no distinction between upper and lower case, so either case is acceptable.

Numerals (i.e., 0 through 9)

Punctuation marks as follows:

! @ # % & ^ ( ) - _ ' { } ~

Unacceptable Characters. Characters other than those shown above are unacceptable characters in a file name. For example, commas, double quotation marks, and spaces are not acceptable.

Note: Remember, extensions begin with a period, so be careful where you use them.

Saving Files

When a file is saved on a diskette, information about the file is stored in the directory. Information such as the file name, size (number of bytes), and date last updated appears in the directory.

When files are added, deleted, or renamed, the directory is automatically updated to reflect the current status of the diskette (see DIR command).

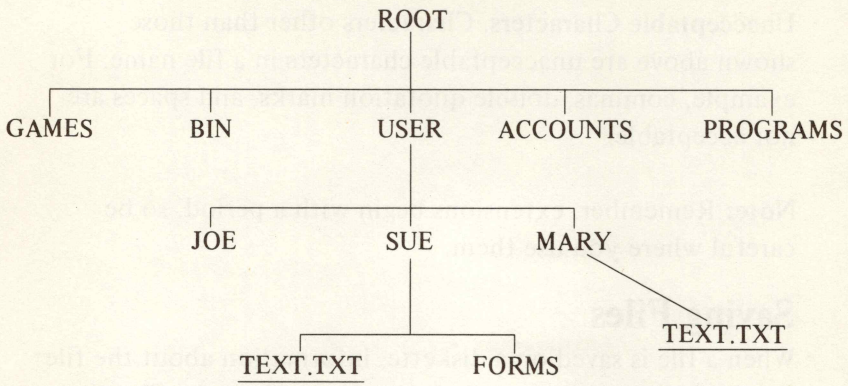
Directory

A directory is a group of files. At the time of power on, you are in the directory called "root directory". You can create subdirectories under the root directory, as well as subdirectories under each subdirectory using the MKDIR command. In this way, you can construct a "tree" structure of directories on a diskette.

You can "travel" around this tree; for example, you can find any file in the system by starting at the root directory and traveling down any of the subdirectories to the desired file, or vice versa.

The directory you are in is called "working directory". You can change your working directory to any directory using the CHDIR command. Unless you take special action when you create a file, the new file is created in your working directory. You can have files of the same name in different directories.

The illustration below shows a typical tree structure of directories.



Note: Those with underline are files.

To identify a file in a different directory from your working directory, specify the file name following each directory name from the root directory.
For example, if you want to identify the TEXT. TXT file in the MARY directory, specify,

\ USER \ MARY \ TEXT. TXT

This name, optionally preceded by the drive specifier, is called "pathname", and the pathname which contains no file name is called "path".
Notice each directory name is separated by back slash (\).

Keyboard Usage

When MS-DOS* is in effect, the keyboard functions as described below.

Enter. This key is used to send a command to the operating system. Always remember to press **Enter** once you have typed the command.

Esc. This key is used to cancel a line. If you have typed a command incorrectly and want to start over, press **Esc**. The command is then cancelled and a backslash appears on the cancelled line.

Backspace. This key moves the cursor backwards, erasing one character at a time. If you discover a typing error while typing a command, press **Backspace**, then re-type the command.

Ctrl/Scroll Lock. Pressing **Scroll Lock** while holding down **Ctrl** stops a command that is currently being processed. Sometimes called "Break", this key is used to abort a program that is running on the system. **Ctrl/C** performs the same function except that it is ineffective if some key is pressed before **Ctrl/C**.

Ctrl/NumLock. Pressing **NumLock** while holding down **Ctrl** stops the display of data on the screen. To continue displaying, press any key. **Ctrl/S** performs the same function except that it is ineffective if some key is pressed before **Ctrl/S.**

PrtSc. This key is used to send information to the printer in MS-DOS*. To print what appears on the screen, press **PrtSc** while holding down **Shift.** (Be sure the printer is connected before you use **PrtSc.**) To print a line every time you press **Enter**, press **Ctrl** and **PrtSc** together. To stop printout, press **Ctrl/PrtSc** again.

F1 or →. This key copies and displays one character from the retained line.

F2. This key copies and displays all characters up to (not including) the specified character.

F3. This key copies all remaining characters from the retained line.

F4. This key skips all characters in the retained line up to (not including) the specified character.

F5. This key accepts the new line as a retained line for more editing.

F6. This key puts a **Ctrl/Z** (^ Z) end-of-file character.

Del. This key skips one character in the retained line.

Ins. This toggle key enters and exits the insert mode as it is pressed.

Note: On most typewriters, number one (1) and the lower case letter "l" can be used in place of each other. The same applies to zero (0) and the letter "O." On the computer, however, these keys have unique meanings and must be used appropriately.

MS-DOS* Prompt

Since you will be working with both the operating system and application software, you need to recognize when MS-DOS* is in effect.

Under MS-DOS*, the system displays the prompt like this:

```
A>
```

There are three typical ways to get to the MS-DOS* prompt:

- System start-up
- Exit an application
- System restart

System Start-up. When you turn on the system with an MS-DOS* diskette in drive A or with MS-DOS* on the hard disk, the MS-DOS* prompt is displayed after the software is loaded into main memory.

Exit an Application. When you exit an application such as word processing, you are returned to MS-DOS*.

System Restart. Pressing **Ctrl/Alt/Del** clears main memory and re-loads MS-DOS*. Remember, you could lose data if you perform this step without first saving your file.

Drive Specifier

The MS-DOS* prompt also identifies the current default disk drive. Look at the following example.

```
A>
```

The "A" tells you that the default drive is drive A. In other words, unless instructed otherwise, all reading and writing will be done to drive A. If you wanted to delete a file on the diskette in drive A, you would only need to enter the MS-DOS* command and the file name as shown in the example below.

```
A>DEL BUDGET.DOC
```

The operating system will look for the file "BUDGET.DOC" on the diskette in drive A. But what if the file is on another drive? You have two options – you can specify the drive location as part of the command or you can change the default drive to the one you like before issuing the command.

For users of the PC-4502

The example below shows how you would include the drive location as part of the command.

```
A>DEL B:BUDGET.DOC
```

The "B:" tells MS-DOS* to look for the file "BUDGET.DOC" on the diskette in drive B.

The example below shows how to change the default to drive B before entering the command to delete the file.

```
A>B:
B>DEL BUDGET.DOC
```

First, "B:" is entered to change the default drive from A to B. Notice how the prompt on the second line is "B>". Once the default has been specified, the command can be entered without the drive being specified.

For users of the PC-4521

The example below shows how you would include the drive location as part of the command.

```
C>DEL A:BUDGET.DOC
```

The "A:" tells MS-DOS* to look for the file "BUDGET.DOC" on the diskette in drive A.

The example below shows how to change the default to drive A before entering the command to delete the file.

```
C>A:
A>DEL.BUDGET.DOC
```

First, "A:" is entered to change the default drive from C to A. Notice how the prompt on the second line is "A>". Once the default has been specified, the command can be entered without the drive being specified.

You can also specify drive B as a conceptual drive. At this time, A: and B: represent "drive A diskette" and "drive B diskette". This function is convenient when using the COPY command or the FC command in the single-drive system.

For example:

```
C>COPY A: SHARP.DOC B:
insert Diskette for drive B: and Strike
any Key when Ready:

1 File(s) copied
```

For details, refer to Appendix A in the optional MS-DOS* manual.

Note: If you are using the optional CE-452F external floppy disk drive with your computer, you cannot use logical drive B.

MS-DOS* Commands

Below is the list of command names contained on the diskettes. Use this as a quick reference to determine the command you want to use.

COMMAND	MS-DOS command processor
ASSIGN	Drive assignment
ATTRIB	Sets or displays file attributes.
AUTOEXEC	Automatic program execution
BACKUP	Backs up one or more files from one disk to another.
BASIC	GW-BASIC system loader
BASICA	GW-BASIC system loader
BREAK	Set **Ctrl/C** check
CHDIR	Changes directories; prints working directory (CD)
CHKDSK	Scans the directory of the default or designated drive and checks for consistency
CLS	Clears screen
COPY	Copies file(s) specified
CTTY	Changes console TTY
DATE	Displays and sets date
DEBUG	Debugger
DEL	Deletes file(s) specified (ERASE)
DIAG45U	Diagnostics program
DIR	Lists requested directory entries
DISKCOMP	Compares diskettes
DISKCOPY	Copies diskettes
EDLIN	Line editor
EXE2BIN	Converts executable files to binary format
EXIT	Exits command and returns to lower level
FC	Compares files

FDISK	Configures hard disks for MS-DOS*
FIND	Searches for a constant string of text
FORMAT	Formats a diskette to receive MS-DOS files
GRAPHICS	Prints graphics
GWBASIC	GW-BASIC interpreter
HDTRNS	Moves the hard disk heads for transportation
JOIN	Join a disk drive to a specified path
LABEL	Labels a diskette
LINK	Linker
MKDIR	Makes a directory (MD)
MODE	Mode selector
MORE	Displays output one screen at a time
PATH	Sets a command search path
PRINT	Background print
PROMPT	Changes the MS-DOS command prompt
RECOVER	Recovers a bad diskette
REN	Renames first file as second file (RENAME)
REPLACE	Replaces previous versions of files
RESTORE	Restores backed up files
RMDIR	Removes a directory (RD)
SET	Sets one string value to another
SHARE	Installs file sharing and locking
SORT	Sorts data alphabetically, forward or backward
SUBST	Substitutes a string for a path name
SYS	Transfers system
TIME	Displays and sets time
TREE	Displays all the paths
TYPE	Displays the contents of file specified
VER	Prints MS-DOS version number
VERIFY	Verifies writes to diskette
VOL	Prints volume identification number
XCOPY	Copys files and subdirectories

DEVICE DRIVERS

ANSI	ANSI escape sequence device driver
DRIVER	Configures installable block device drivers.
RAMDRIVE	Installs a RAM drive.

Syntax

MS-DOS* commands must be entered in a specific sequence and must include certain parameters such as file name and drive designator. The syntax or rules for entering these commands are described below.

Commands always begin with the command name, followed by one blank space. Following the blank space are the parameters for the command. Parameters are additional information you supply with the command.

Two common parameters are file name and disk drive specifier. In command syntax, file name is shown as "filename" and disk drive specifier is shown as "d:".

When you enter the file name, be sure to include the file extension if one exists. When you specify a disk drive, enter the disk drive letter (e.g., A, B, C), followed by a colon.

Some parameters are optional while others are required. Optional parameters are shown in brackets (e.g., [filename]).

The following syntax notation is used in descriptions of commands:

[ ]	Square brackets indicate that the enclosed entry is optional.
< >	Angle backets indicate data you must enter. When the angle brackets enclose lowercase text, you must type in an entry defined by the text; for example, < filename >.
{ }	Braces indicate that you have a choice between two or more entries. At least one of the entries enclosed in braces must be chosen unless the entries are also enclosed in square brackets.
...	Ellipses indicate that an entry may be repeated as many times as needed or desired.
|	A bar indicates an OR statement in a command.

Below is the table of syntaxes of command names.

COMMAND [⟨d:⟩ ⟨pathname⟩] [⟨cttydev⟩]
[/C ⟨string⟩] [/E: ⟨nnn⟩]
ASSIGN [X= Y[...]]
ATTRIB [+R|–R] [+A|–A] [⟨d:⟩] ⟨pathname⟩
BACKUP [d:] ⟨pathname⟩⟨d:⟩ [/S] [/M] [/A]
[/D: ⟨date⟩] [/T: ⟨time⟩]
BASIC [⟨d:⟩] [⟨pathname⟩]
BASICA [⟨d:⟩] [⟨pathname⟩]
BREAK [ON|OFF]
CHDIR [⟨path⟩]
CHKDSK [⟨d:⟩] [⟨filename⟩] [/F] [/V]
CLS
COPY [/A] [/B] [⟨d:⟩] ⟨pathname⟩ [/A] [/B]
[⟨d:⟩] [⟨pathname⟩] [/A] [/B] [/V]
CTTY ⟨device⟩
DATE [⟨mm⟩–⟨dd⟩–⟨yy⟩]
DEL [⟨pathname⟩ | ⟨filename⟩]
DIAG45U
DIR [⟨d:⟩] [⟨pathname⟩] [/P] [/W]
DISKCOMP [⟨d:⟩] [⟨d:⟩] [/1] [/8]
DISKCOPY [⟨d:⟩] [⟨d:⟩[[/1]
EXE2BIN [⟨d:⟩]
EXIT
FC [/A] [/B] [/C] [/L] [/LB⟨n⟩] [/T] [/W] [/⟨NNNN⟩]
⟨filename 1⟩⟨filename 2⟩
FDISK
FIND [/V] [/C] [/N] ⟨"string"⟩ [⟨d:⟩] [⟨pathname⟩]
FORMAT [⟨d:⟩] [/1] [/4] [/8] [/B] [/S] [/V]
GRAPHICS [⟨printer⟩] [/R] [/B]
GWBASIC [⟨d:⟩] [⟨pathname⟩]
HDTRNS
JOIN ⟨d:⟩ ⟨d:⟩⟨pathname⟩ [/D]
LABEL [⟨d:⟩] [⟨volume name⟩]
MKDIR ⟨path⟩
MODE COM⟨n⟩: ⟨baud rate⟩ [,⟨parity⟩ [,⟨data bit⟩
[,⟨stop bit⟩ [,P]]]]

MODE LPT ⟨n⟩ : = **COM** ⟨m⟩
MODE LPT ⟨n⟩ : [⟨chars⟩] [, [⟨lines⟩] [, P]]
MODE ⟨display⟩
MODE [⟨display⟩], ⟨shift⟩ [, T]
MORE
PATH [⟨d:⟩⟨pathname⟩ [; ⟨d:⟩⟨pathname⟩] ...]
PRINT [[⟨d:⟩] [⟨pathname⟩] [/D:⟨device⟩]
[/B:⟨size⟩] [/U:⟨busytick⟩] [/M:⟨maxtick⟩]
[/S:⟨timeslice⟩] [/Q:⟨value⟩] [/T] [/C] [/P]
PROMPT [⟨prompt- text⟩]
RECOVER [⟨filename⟩ | ⟨d:⟩]
REN ⟨filename⟩ ⟨filename⟩
REPLACE [⟨d:⟩] ⟨pathname⟩ [⟨d:⟩] [⟨path⟩]
[/A] [/D] [/P] [/R] [/S] [/W]
RESTORE ⟨d:⟩ [⟨d:⟩] [⟨pathname⟩] [/S] [/P]
RMDIR ⟨d:⟩⟨path⟩
SET [⟨string⟩ = [⟨string⟩]]
SHARE [/F:⟨filename⟩] [/L:⟨locks⟩]
SORT [⟨d:⟩] [⟨pathname⟩] [/R] [/+n]
SUBST [⟨d:⟩] [⟨pathname⟩] [/D]
SYS ⟨d:⟩
TIME [⟨hh⟩ [:⟨mm⟩]]
TREE [⟨d:⟩] [/F]
TYPE [⟨d:⟩] ⟨pathname⟩
VER
VERIFY [ON | OFF]
VOL [⟨d:⟩]
XCOPY [⟨d:⟩] [⟨pathname⟩] ⟨filename⟩ [⟨d:⟩]
[⟨pathname⟩] [⟨filename⟩] [/A] [/D:⟨mm-dd-yy⟩]
[/E] [/M] [/P] [/S] [/V] [/W]

BATCH PROCESSING COMMANDS

ECHO [ON|OFF|message]
FOR %% <C> IN <set> DO <command>
– for bath processing
or

FOR % <C> IN <set> DO <command>
    – for interactive processing
GOTO <label>
IF [NOT] <condition> <command>
PAUSE [comment]
REM [comment]
SHIFT

EDLIN COMMAND

[<line>]	(Edits line no.)
[<n>] A	(Appends lines)
[<line>], [<line>], <line> [,<count>] C	(Copies lines)
[<line>] [,<line>] D	(Deletes lines)
E	(Ends editing)
[<line>] I	(Inserts lines)
[<line>] [,<line>] L	(Lists text)
[<line>], [<line>], <line> M	(Moves lines)
[<line>] [,<line>] P	(Pages text)
Q	(Quits editing)
[<line>] [,<line>] [?] R [<string 1>] [Ctrl/Z] [<string 2>]	(Replaces lines)
[<line>] [,<line>] [?] S [<string>]	(Searches text)
[<line>] T <filename>	(Transfers text)
[<n>] W	(Writes lines)

DEBUG COMMAND

A [<address>]	(Assemble)
C <range> <address>	(Compare)
D [<range>]	(Dump)
E <address> [<list>]	(Enter)
F <range> <list>	(Fill)

G [=<address> [<address>...]]	(Go)
H <value> <value>	(Hex)
I <value>	(Input)
L [<address> [<druve> <record> <record>]]	(Load)
M <range> <address>	(Move)
N <filename> [<filename>]	(Name)
O <value> <byte>	(Output)
Q	
R [<register-name>]	(Register)
S <range> <list>	(Search)
T [=<address>] [<value>]	(Trace)
U [<range>]	(Unassemble)
W [<address> [<drive> <record> <record>]	(Write)

The rest of this section provides a more detailed description of some of the above commands.

BACKUP

This command is used to back up the files stored on the hard disk onto the floppy diskette(s). You must format the diskette(s) before use.

Example:

```
A>BACKUP C: A:

Source disk is Non-removable

Insert backup diskette 01 in drive A:

Warning! Files in the target drive
A: root directory will be erased
Strike any key when ready

    Backing up files to drive A:
Diskette Number: 01

 SHARP 1. DOC
 SHARP 2. DOC
```

CHDIR

This command changes your working directory to the specified one. You can specify the directory by typing from the root directory (\) or working directory down to the one you like. You must separate directories with the backward slash mark (\). Entering this command without directory name displays the current working directory.

Example:

```
A>CHDIR \WP\SHARP\ABC
```

CHKDSK

This command is used to check and report on the status of the diskette and memory. It scans the directory of the default or specified drive and checks it for any structural errors. Once the diskette has been checked, the system displays any error messages followed by a status report.

Example:

```
A>CHKDSK A:
Volume SHARP created Jan 1, 1987 9:00a

    730112 bytes total disk space
     25600 bytes in 3 hidden files
      1024 bytes in 1 directory
    159744 bytes in 27 user files
    543744 bytes available on disk

    262144 bytes total memory
    231152 bytes free
```

COPY

This command copies a file from one diskette to another or onto the same diskette. The /V parameter can be included to instruct the system to verify the copy was successful.

Example:

```
A>COPY MEMO.DOC B:MEMO.85
        1 File(s) copied
```

Note: All files in the same directory must have a unique name. When copying a file in the same directory, rename the copy.

```
A>COPY MEMO.DOC NEWMEMO.DOC
        1 File(s) copied
```

DEL

This command deletes files that are no longer needed from the diskette. The process removes the file name from the directory and makes speace available for new files.

CAUTION: Use this command only when you are certain you want to delete the file. Data is lost once this command is used.

Example:

```
A>DEL MEMO.DOC
```

DIR

This command lists file names, file sizes, and date files were last updated. If a file name is not specified, all directory entries on the diskette in the default drive display. The parameter /P can be added to cause the system to pause once a screen is full. Press any key to continue. The parameter /W can also be added to list only file names in five columns across the screen.

Example:

```
A>DIR

Volume in drive A has no label
Directory of A:\

COMMAND  COM    15957     8-01-85 12:00p
AUTOEXEC BAT       26     7-26-86 12:07a
CONFIG   SYS       27     4-28-87  1:59p
BIN          directory    7-26-86 12:00a
        4 File(s)    543744 bytes free
```

DISKCOMP

This command compares one diskette to another on a track-by-track basis. If any tracks are unequal, error messages are issued.

Example 1 (PC-4502)

```
A>DISKCOMP A: B:

Insert FIRST diskette in drive A:

Insert SECOND diskette in drive B:

Press any key when ready ...

Comparing 80 tracks
9 sectors per track, 2 Sides

Compare OK

Compare another diskette (Y/N)?
```

Example 2 (PC-4521)

```
A>DISKCOMP A: A:

Insert FIRST diskette in drive A:

Press any key when ready

Comparing 80 tracks
9 sectors per track, 2 Sides

Insert SECOND diskette in drive A:

Press any key when ready

Insert FIRST diskette in drive A:

Press any key when ready

Insert SECOND diskette in drive A:

Press any key when ready

Compare OK

Compare another diskette (Y/N)?
```

DISKCOPY

This command copies all files on one diskette to another. If a new diskette is used as the destination diskette, DISKCOPY automatically formats the diskette before copying.

Example 1 (PC-4502)

```
A>DISKCOPY A: B:

Insert SOURCE diskette in drive A:

Insert TARGET diskette in drive B:

Press any key when ready ...

Copying 80 tracks
9 Sectors/Track, 2 Sides

Formatting while copying

Copy another diskette (Y/N)?
```

Example 2 (PC-4521)

```
A>DISCOPY A: A:

Insert SOURCE diskette in drive A:

Press any key when ready ...

Copying 80 tracks
9 Sectors/Track, 2 Sides

Insert TARGET diskette in drive A:

Press any key when ready ...

Formatting while copying

Insert SOURCE diskette in drive A:

Press any key when ready ...

Insert TARGET diskette in drive A:

Press any key when ready ...

Insert SOURCE diskette in drive A:

Press any key when ready ...

Insert TARGET diskette in drive A:

Press any key when ready ...

Copy another diskette (Y/N)?
```

FC

This command compares individual files on the same diskette or different diskettes on a byte by byte basis. Any unequal bytes result in error messages. It is frequently used after copying to verify that the copy was successful.

Example:

```
A>FC MEMO.DOC B:MEMO.DOC
```

FORMAT

This command prepares a diskette for use with MS-DOS*. In addition, this command checks for defective tracks on the diskette. The /S parameter can be added to copy the internal operating system programs after formatting the diskette.

CAUTION: FORMAT will erase any files stored on the diskette.

Note: The DISKCOPY command formats a diskette as part of the copy operation.

```
A> FORMAT A:/S/V
Insert new diskette for drive A:
and strike ENTER when ready


Format complete
System transferred

Volume label (11 characters, ENTER for none)? SALESREP

  XXXXXXX bytes total disk space
    XXXXX bytes used by system
  XXXXXXX bytes available on disk

Format another (Y/N)?_
```

MKDIR

This command makes a new directory at the location and with the name you specify.

Example:

```
A>MKDIR \WP\SHARP\ABC
```

RENAME

This command changes the name of existing files.

Example:

```
A>REN MEMO.DOC LETTER.DOC
```

RESTORE

This command restores data backed up on the floppy diskette(s) onto the hard disk. Notice that you can restore only the files backed up with the BACKUP command and cannot restore the other files.

Example:

```
C>RESTORE A: C:

Target is Non-Removable

Insert backup diskette 01 in drive A:
Strike any key when ready

***Files were backed up on 8/8/1987***

    Restoring files from drive A:***
Diskette: 01

\SHARP1. DOC
\SHARP2. DOC
```

TYPE

This command displays the contents of a file.

Example:

```
A>TYPE SALESRPT.DOC
```

Once the command is entered, the system then displays the file contents. If you need to stop a file as it displays on the screen, use **Ctrl/NumLock.**

Global Commands

Global commands are commands that are carried out on a group of related files.

Instead of specifying a specific file name to be copied, deleted, renamed, etc., all file names in a given category can be specified. Two characters, the question mark (?) and the asterisk (*), are used as wild cards when specifying file names.

Let's look at the ? character first. The example below shows how the ? character can be used to mask one character in the file name.

```
A>DEL BUDGET.7?
```

The ? character means that any character may occupy the ? position in the file name. All other characters in the file name must match.

In this example, the files BUDGET.77, BUDGET.78, and BUDGET.79 would all be deleted. The file BUDGET.80 would not be deleted.

Let's look at the * character. The example below shows how the * character is used to mask many characters in the file name.

```
A>DIR *.DOC
```

The * character, when used as part of a file name, means that any characters can occupy the position of the *, and the remaining positions up to the file extension.

In this example, the files MEMO.DOC, LETTER.DOC, and SALES.DOC would display in the directory. In other words, all file names with the extension .DOC would display.

Note: Using *.* in a command means all files are affected.

CAUTION: Although global commands are time savers, they should be used carefully, especially with DEL. Entering a sequence such as DEL *.* would delete all files on the diskette.

Automatic Program Execution

If you want to run a specific program automatically each time you start MS-DOS*, you can do so with Automatic Program Execution.

When you start MS-DOS*, the command processor searches for a file named AUTOEXEC.BAT on the MS-DOS* diskette. This file is a program that MS-DOS* will run each time MS-DOS* is started.

If MS-DOS* finds the AUTOEXEC.BAT file, the file is immediately executed by the command processor and the date and time prompts are bypassed.

If MS-DOS* does not find an AUTOEXEC.BAT file when you first load the MS-DOS* diskette, then the date and time prompts will be issued.

Example:

If you wanted to automatically display the directory of the diskette in drive A each time you started MS-DOS*, you could create an AUTOEXEC.BAT file as follows:

Note: The MS-DOS* diskette provided with the computer contains important data in the AUTOEXEC.-BAT file. Since the example below destroys the original AUTOEXEC.BAT file, use a diskette which does not contain an AUTOEXEC.BAT file.

1. Type:

   COPY CON AUTOEXEC.BAT

   and press **Enter.**
   This statement tells MS-DOS* to copy the information from the console (keyboard) into the AUTOEXEC.BAT file. Note that the AUTOEXEC.BAT file must be created in the root directory of your MS-DOS* diskette.

2. Now type:

   DIR

   and press **Enter.**
   This statement goes into the AUTOEXEC.BAT file. It tells MS-DOS* to display the directory whenever MS-DOS* is started.

3. Type **Z** while holding down the **Ctrl** key and then press the **Enter** key to put the command DIR in the AUTOEXEC.BAT file.

4. The directory will now be automatically displayed whenever you start MS-DOS*.

Command Piping

If you want to give more than one command to the system at a time, you can "pipe" commands to MS-DOS. For example, you may occasionally need to have the output of one program sent as the input to another program. A typical case would be a program that produces output in columns. It could be desirable to have this columnar output sorted.

Piping is done by separating commands with the pipe separator "|". For example, the command

```
DIR |SORT
```

will give you an alphabetically sorted listing of your directory. The character "|" causes all output generated by the left side of this character to be sent to the right side of this character for processing.

Piping can also be used when you want to output to a file. If you want your directory sorted and sent to a new file (for example, DIREC.FIL), you could type:

```
DIR |SORT >DIREC.FIL
```

MS-DOS will create a file named DIREC.FIL on your default drive. DIREC.FIL contains a sorted listing of the directory on the default drive, since no other drive was specified in the command. To specify a drive other than the default drive, type:

```
DIR |SORT >B:DIREC.FIL
```

This sends the sorted data to a file named DIREC.FIL on drive B.

A pipeline may consist of more than two commands. For example,

```
DIR |SORT |MORE
```

will sort your directory, show it to you one screen at a time, and put -- More -- at the bottom of your screen when there is more output to be seen.

CONFIG.SYS File

In many cases, there are installation-specific settings for MS-DOS* that need to be configured at system startup. An example of this is a standard device driver, such as an online printer.

The MS-DOS* configuration file (CONFIG.SYS) allows you to configure your system with a minimum of effort. With this file, you can add device drivers to your system at startup. The configuration file is simply an ASCII file that has certain commands for MS-DOS* startup (boot). The boot process is as follows:

1. The diskette boot sector is read. This contains enough code to read MS-DOS* code and the installation's BIOS (machine-dependent code).

2. The MS-DOS* code and BIOS are read.

3. A variety of BIOS initializations are done.

4. A system initialization routine reads the configuration file (CONFIG.SYS), if it exists, to perform device installation and other user options. Its final task is to execute the command interpreter, which finishes the MS-DOS* boot process.

If there is not a CONFIG. SYS file on the MS-DOS diskette, you can use the MS-DOS* editor, EDLIN, or COPY command to create a file; then save it on the MS-DOS* diskette in your root directory.

The following is a list of commands for the configuration file CONFIG.SYS:

BUFFERS = <number>
This is the number of sector buffers that will comprise the system list. It is installation-dependent. If not set, 2 is a reasonable number.

FILES = <number>
This is the number of open files that the XENIX system calls can access. It is installation-dependent. If not set, 8 is a reasonable number.

DEVICE = <filename>
This installs the device driver in <filename> into the system list.

BREAK = <ON or OFF>
If ON is specified (the default is OFF), a check for **Ctrl/C** as input will be made every time the system is called. ON improves the ability to abort programs over previous versions of the MS-DOS*.

SHELL = <filename>
This begins execution of the shell (top-level command processor) from <filename>.

COUNTRY = ⟨value⟩

This value allows MS-DOS to use international time, date, currency, and case conversion.

Value	Country	Date	Time
001	United States	mm-dd-yy	hh:mm:ss.cc
031	Netherlands	dd-mm-yy	hh:mm:ss,cc
032	Belgium	dd/mm/yy	hh:mm:ss,cc
033	France	dd/mm/yy	hh:mm:ss,cc
034	Spain	dd/mm/yy	hh:mm:ss,cc
039	Italy	dd/mm/yy	hh:mm:ss,cc
041	Switzerland	dd.mm.yy	hh.mm.ss.cc
044	United Kingdom	dd-mm-yy	hh:mm:ss.cc
045	Denmark	dd/mm/yy	hh.mm.ss,cc
046	Sweden	yy-mm-dd	hh.mm.ss,cc
047	Norway	dd/mm/yy	hh.mm.ss,cc
049	Germany	dd.mm.yy	hh.mm.ss,cc
061	Australia	dd-mm-yy	hh:mm:ss.cc
358	Finland	dd-mm-yy	hh:mm:ss,cc
972	Israel	dd/mm/yy	hh:mm:ss.cc

The default value is set at the United States (001).

DRIVPARM = /d: ⟨dd⟩ [/C] [/f: ⟨ff⟩] [/h: ⟨hh⟩] [/n] [/s: ⟨ss⟩] [/t: ⟨ttt⟩]

This command allows you to define parameters for block devices when you start MS-DOS*, overriding the original MS-DOS device driver settings. For details, see the optional MS-DOS* manual.

FCBS = ⟨m⟩, ⟨n⟩

This command allows you to determine the number of file control blocks that can be currently open. For details, see the optional MS-DOS* manual.

LASTDRIVE = ⟨x⟩

This command sets the maximum number of drives you may access. ⟨x⟩ can be any letter from A to Z. The default value is E.

A typical configuration file might look like this:

```
Buffers = 10
Files = 10
Device = \BIN \NETWORK.SYS
Break = ON
Shell = A: \BIN \COMMAND.COM A: \BIN
```

Note here that the Buffers and Files parameters are set to 10. The system initialization routine will search for the filename \BIN \NETWORK.SYS to find the device that is being added to the system. This file is usually supplied on diskette with your device. Make sure that you save the device file in the pathname that you specify in the Device parameter.

This configuration file also sets the MS-DOS* command EXEC to the COMMAND.COM file located in the \BIN directory on diskette A. The A: \BIN tells COMMAND.COM where to look for itself when it needs to re-read from diskette.

RAM Drive

RAMDRIVE.SYS is a device driver that lets you use a portion of your computer's memory as if it were a disk drive. This memory area is called a RAM drive and is sometimes referred to as a virtual disk.

RAM drives are much faster than disk drives because the information they contain is always loaded into memory. If you have the optional CE-453B EMS memory card, you

can use this memory for one or more RAM drives. Otherwise RAMDRIVE.SYS locates RAM drives in low memory.

To install RAMDRIVE.SYS, include the following command in your CONFIG.SYS file:

DEVEICE = RAMDRIVE.SYS [⟨bbbb⟩] [⟨ssss⟩] [⟨dddd⟩]
[/a]

The ⟨bbbb⟩ option specifies the disk size in kilobytes. The default is 64, and the minimum value is 16.

The ⟨ssss⟩ option specifies the sector size in bytes. The default value is 128. The values: 128, 256, 512, and 1024 are allowed.

The ⟨dddd⟩ option specifies the number of root directory entries. The default value is 64, the minimum value is 2, and the maximum value is 1024.

RAMDRIVE.SYS adjusts the value of ⟨dddd⟩ to the nearest sector boundary. For example, if you give a value of 25 when the sector size is 512 bytes, the 25 will be rounded up to 32. This is because 32 is the next multiple of 16 (there are sixteen 32-byte directory entries in 512 bytes).

The /a option lets you use the optional CE-453B EMS card for a RAM drive, if it has been installed.

Note: When you reset or turn off the power on your computer, the information stored in RAM drives is lost.

Internal Options

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Overview

This chapter describes options that are installed as part of the internal hardware.

The first section describes how to install the CE-451R RAM card and CE-700R RAM expansion kit in the PC-4502.

The second section describes how to install the CE-451A color/monochrome CRT adaptor.

The third section describes the CE-451B serial I/O card.

The fourth section describes the CE-451M modem card.

Memory

Note: This section is applicable to the PC-4502 only.

The PC-4502 is configured with a total of 256K of main memory (RAM).

If you need to expand RAM, you can install the CE-451R RAM card to increase 128K memory. The CE-451R also contains two rows of RAM chip sockets, four sockets per row. This is where the CE-700R RAM chips can be installed in increments of 128K (or one row) up to a total of 640K.

Installation

The CE-451R optional RAM card is installed on the underside of the main unit.

To begin installation, turn off power to the main unit and disconnect the AC adaptor cord and external devices connected to the main unit.

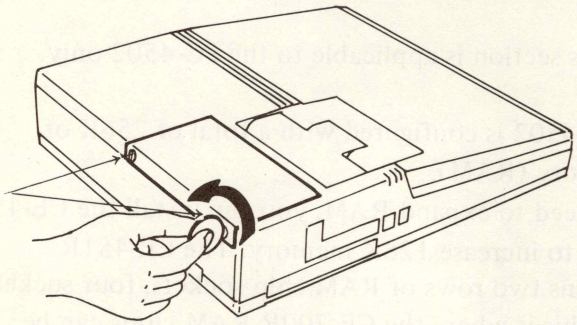
Next, disconnect the battery as described below.

WARNING: *This equipment contains electrical circuits that can cause bodily injury. Never remove the battery cover unless the main unit is turned off and the AC adaptor cord disconnected.*

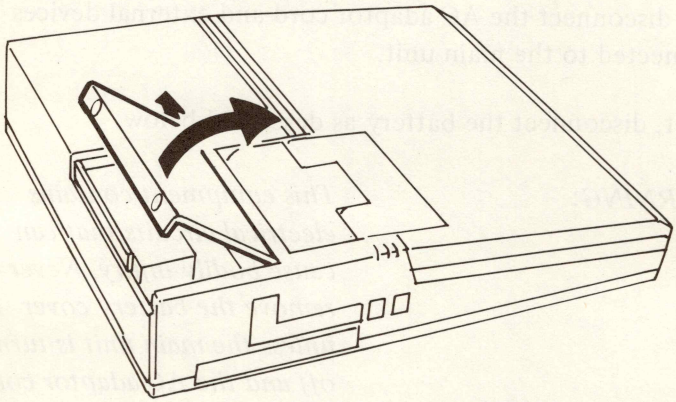
Close the unit and place face up as shown on the next page.

Next, using a coin, do the following:

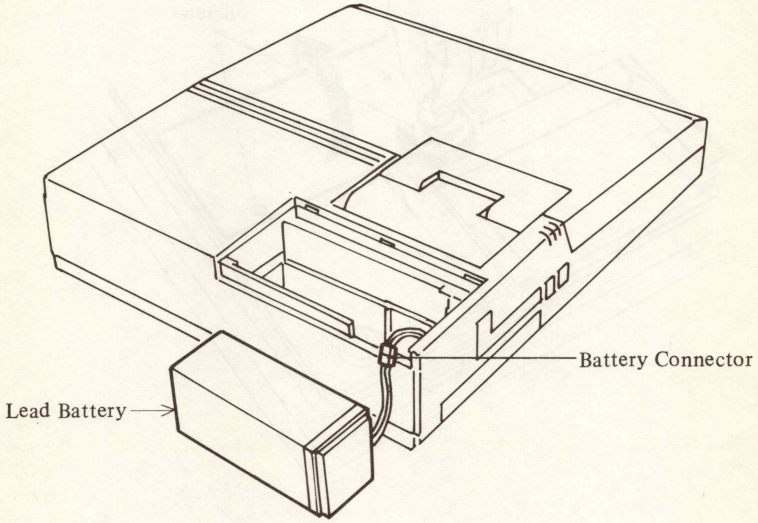
1. Unscrew, but do not remove, the two screws.



2. Remove the cover.



3. Take out the lead battery, and disconnect the battery connector.

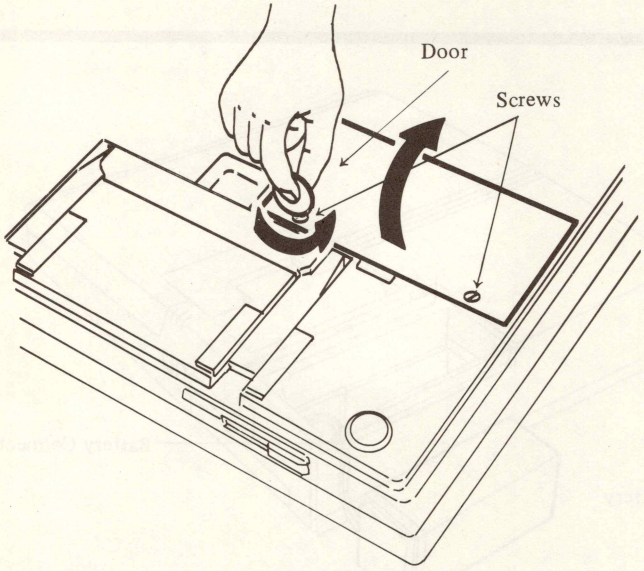


4. Replace the cover and tighten the screws.

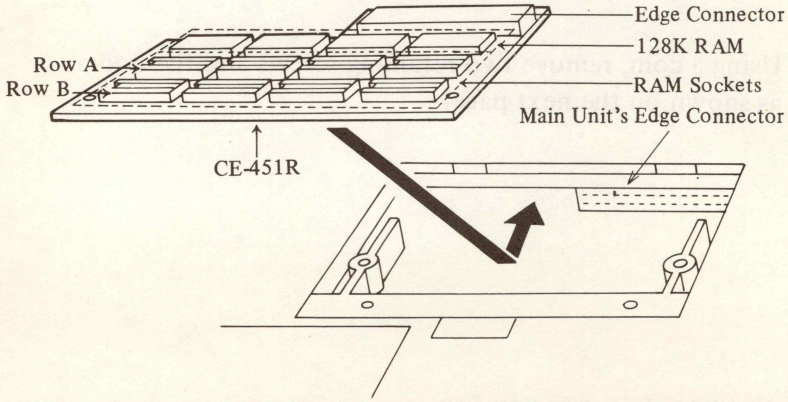
Next, do the following:

1. Turn the main unit over so that it is face down.

2. Using a coin, remove two retaining screws and the door as shown on the next page.



3. Insert the optional RAM card's edge connector into the main unit's edge connector.

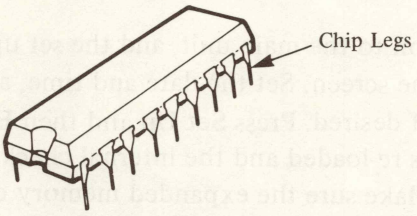


To further increase memory, install additional CE-700R RAM kits on the RAM sockets of the CE-451R in rows A and B. Each additional kit increases the capacity of main memory by 128K.

To add a row of RAM (128K), do the following:

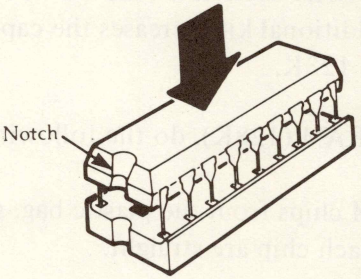
1. Remove the RAM chips from the plastic bag, making sure that the legs on each chip are straight.

CAUTION: RAM chips are extremely sensitive to static electricity. Try to eliminate any static between you and the chips during installation. Failure to do so may result in damage to the chips and/or the computer.



2. Insert one chip into the first socket in row A, making sure that the notch is facing the same direction as the standard RAM chips. Press down on both edges to make certain the chip is fully inserted.

Note: When inserting, be careful not to bend the legs on the RAM chips.



3. Insert the remaining three chips for the row in the same fashion.
4. If desired, do the same for row B.

After installing the additional RAM, fit the door in place, and tighten the screws to secure. Then replace the battery as described in Chapter 2.

This completes installation of additional RAM.

Turn power on to the main unit, and the set up menu appears on the screen. Set the date and time, and modify other fields if desired. Press **Set Up** and then **Enter**. The system is re-loaded and the internal checks are performed. Make sure the expanded memory capacity appears on the screen.

Note: One of the following types of RAM chips can be used for the CE-700R:

Hitachi	HM50464P-15
Fujitsu	MB81464-15
NEC	μPD41464C-15
Toshiba	TMM41464P-15

Be sure not to insert different types of RAM chips in one row.

Color/ Monochrome CRT Adaptor

This section describes how to install the CE-451A color/ monochrome CRT adaptor in the computer to enhance display capabilities. Once the adaptor is installed, a color CRT with specifications conforming to IBM* Color Display or a monochrome CRT with specifications shown on the next page can be connected to the system.

Note: Composite monitors and color televisions can not be used with your computer.

Specifications for connectable color CRT

Interface:	R(red), G(green), B(blue), and I(intensity), V-synch, H-synch, completely separate, TTL level interface.
Video signal	
Video amp bandwidth:	15.7 KHz to 15 MHz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Horizontal synch signal	
Horizontal scan frequency:	15.7 KHz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Vertical synch signal	
Vertical scan frequency:	60 Hz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Scan method:	Non-interlaced
Interfacing connector:	9-pin D-SUB connector, male

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Red	Output
4	Green	Output
5	Blue	Output
6	Intensity	Output
7	Not used	
8	Horizontal synch	Output
9	Vertical synch	Output

Specifications for connectable monochrome CRT

Interface:	Video and I(intensity), V-synch, H-synch, completely separate, TTL level interface.
Video signal	
Video amp bandwidth:	18.432 KHz to 16.27 MHz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Horizontal synch signal	
Horizontal scan frequency:	18.432 KHz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Positive
Vertical synch signal	
Vertical scan frequency:	50 Hz
Signal level:	2.4V (min) to 5.25V (max)
Signal polarity:	Negative
Scan method:	Non-interlaced
Interfacing connector:	9-pin D-SUB connector, male

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Not used	
4	Not used	
5	Not used	
6	Intensity	Output
7	Video	Output
8	Horizontal synch	Output
9	Vertical synch	Output

Installation

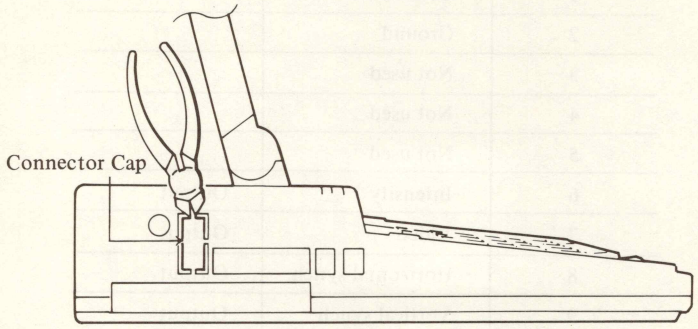
The CE-451A color/monochrome CRT adaptor is installed inside the battery cover.

To begin, close down the system as if you were getting ready for travel. This includes turning off power and disconnecting the AC adaptor cord and external devices connected to the main unit.

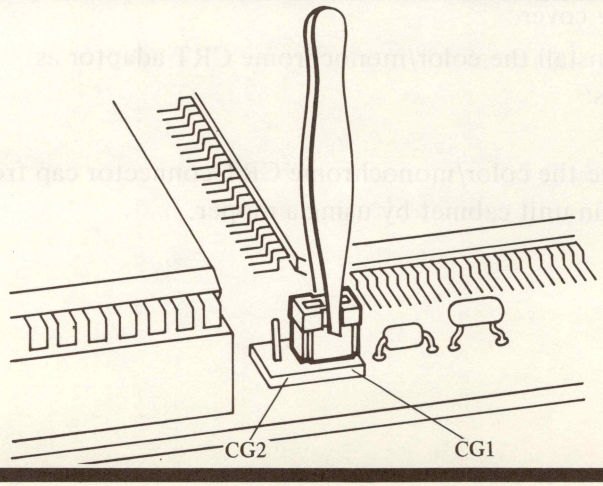
Next, remove the battery cover and battery as described in the first section of this chapter. Do not replace the battery cover.

Then install the color/monochrome CRT adaptor as follows:

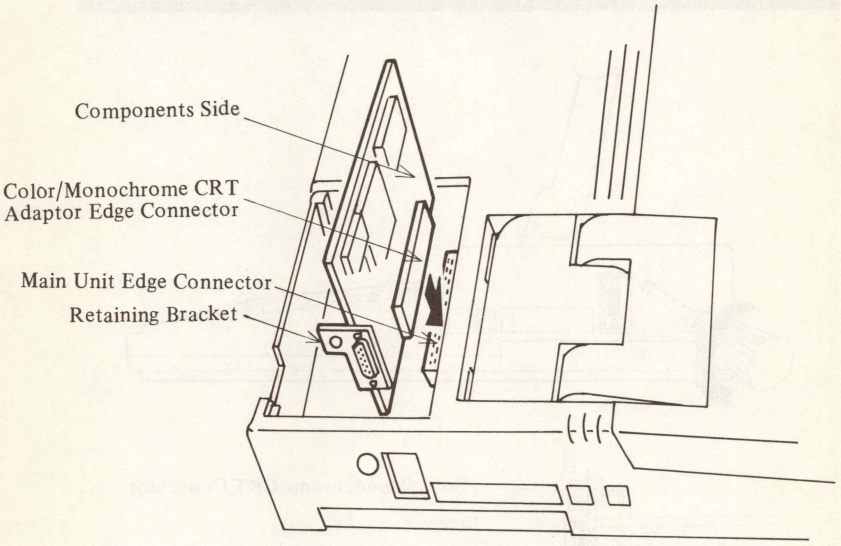
1. Remove the color/monochrome CRT connector cap from the main unit cabinet by using a nipper.



2. Before inserting the adaptor card, set the jumper plug according to the type of character set (CG1 or CG2). The original setting is for CG1. The character setting should remain at CG1 unless you are using the character set for Denmark/Norway. In that case, set the jumper switch to CG2.

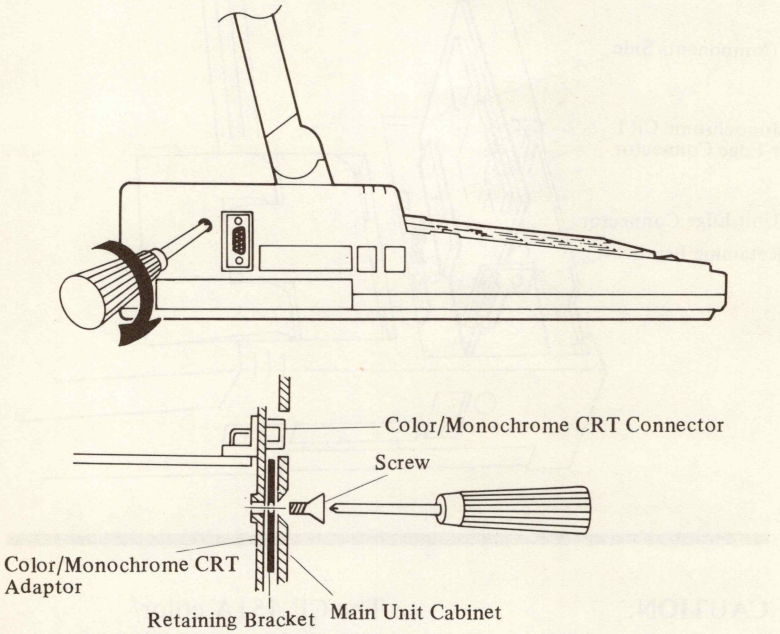


3. Insert the edge connector of the color/monochrome CRT adaptor into the edge connector of the main unit.



CAUTION: The CE-451A color/monochrome CRT adaptor is very sensitive to static electricity. Be extremely careful when handling it. The bag containing the color/monochrome CRT adaptor protects it from static electricity. Keep the adaptor inside the bag until it is installed.

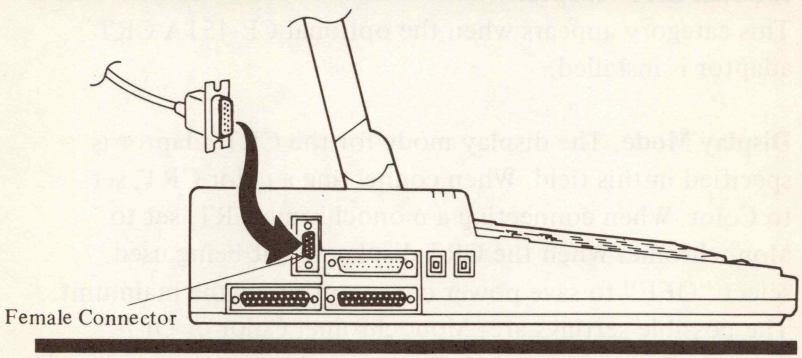
4. Secure the retaining bracket of the adaptor to the main unit by tightening one screw with a Phillips head screwdriver.



5. Connect the battery connector, and replace the battery.

6. Replace the battery cover, and tighten the two screws with a coin.

7. Connect the CRT to the main unit's color/monochrome CRT port on the rear panel with the CRT cable.



8. If the cable end has retaining screws, use them to fasten the cable to the main unit.

Set Up Functions

As described in Capter 4, certain set up functions control the operation of the CE-451A CRT adaptor.

Once you have installed the CRT adaptor, it is necessary to modify the set up screen.

Since you removed the battery during the installation process, the set up screen appears just by turning power on to the computer.

```
        SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)

------- Clock ---------------   ----Communication---  ------ Printer --------
Time: 03:16:54                  COM1: Not Present     Interface:      Parallel
Date: Sat March 21, 1987        COM2: Not Present     Port Address:       3BCh

------- Power ---------------
On Condition:   None

------- Display -------------                         ------ System ---------
Display Mode:       Graphics                          Speed:          Standard
Cursor Blink:       2/second                          Key Click:           Off
Cursor Type:        Underline                         Console:             CGA
Character Blink:    1/second                          Drive A:  Internal 3.5"
Background:         Standard
Backlight:          On
Backlight Timeout:  2 minutes                         Default Setup:       F1

---- Internal CRT Adaptor ---
Display Mode:       Monochrome
 1. Position cursor          2. Press Spacebar          3. Press Set Up key
    using cursor keypad         to change                  to Update and Exit
```

Clock

The backup memory is lost once the battery is removed. Re-enter the date and time.

Internal CRT Adaptor
This category appears when the optional CE-451A CRT adaptor is installed.

Display Mode. The display mode for the CRT adaptor is specified in this field. When connecting a color CRT, set to Color. When connecting a monochrome CRT, set to Monochrome. When the CRT display is not being used, select "OFF" to save power consumption of the main unit. The possible settings are: Monochrome, Color or OFF.

Note: Always set the CRT mode to "OFF" when you disconnect the CRT.

CAUTION: Be sure the CRT display mode setting in the set up screen is appropriate. If the setting is wrong, the CRT may be damaged.

Dip Switch Settings

Dip switches on the bottom panel of the unit are used to indicate the type of display being used. See Chapter 3 for further information on these settings.

Device Indicator

When installing certain application software, you may be asked to identify the type of screen being used. When set to the color mode, the CE-451A color/monochrome CRT adaptor has the same functions as the IBM* color graphics adaptor except that the CE-451A has no composite video output. When set to the monochrome mode, the CE-451A has the same function as the IBM* monochrome adaptor except that the CE-451A has no parallel printer interface.

Serial I/O Card

This section provides a description of the CE-451B serial I/O (Input/Output) card designed to connect serial printer, external modem and mouse pointing devices to main unit.

To install the serial I/O card, contact the Sharp Service Center or an authorized Sharp dealer.

Set Up Functions

As described in Chapter 4, certain set up functions control the operation of the CE-451B serial I/O card.

Once you have installed the serial I/O card, these functions appear on the set up screen.

To access the set up screen, turn on the main unit, then press the **Set Up** key. The set up screen then displays as shown in the example below.

```
        SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)

------- Clock ---------------   ----Communication---  ------ Printer --------
Time: 03:16:54                  COM1: Internal SIO    Interface:     Parallel
Date: Sat March 21  1987        COM2: Not Present     Port Address:      3BCh

------- Power ---------------   -COM1: Internal SIO-
On Condition:    None           Baud Rate:   1200
                                Data Bits:      8
                                Stop Bits:      1
------- Display -------------   Parity:      None     ------ System ---------
Display Mode:        Graphics                         Speed:          Standard
Cursor Blink:        2/second                         Key Click:           Off
Cursor Type:         Underline                        Console:             CGA
Character Blink:     1/second                         Drive A:  Internal 3.5"
Background:          Standard
Backlight:           On
Backlight Timeout:   2 minutes                        Default Setup:       F1

  1. Position Cursor              2. Press Spacebar          3. Press Set Up key
     using cursor keypad             to change                  to Update and Exit
```

Notice the setting for Internal SIO in the middle of the screen.

Also, notice the COM1 or COM2 setting is "Internal SIO".

The following is a description of the internal SIO settings that control the CE-451B serial I/O card. (If you need instructions on moving around this screen and making changes, see Chapter 4.)

Baud Rate. The possible settings are: 110, 150, 300, 600, 1200, 2400, 4800, or 9600.

Data Bits. The possible settings are: 7 or 8.

Stop Bits. The possible settings are: 1 or 2.

Parity. The possible settings are: None, Even, or Odd.

Modem Card

This section describes the CE-451M modem card. This card contains a serial I/O adaptor for alternate use. To install the modem card, contact Sharp Service Center or authorized Sharp dealer.

Set Up Functions

As described in Chapter 4, certain set up functions control the operation of the CE-451M modem card.

Once you have installed the modem card, these functions appear on the set up screen.

To access the set up screen, turn on the main unit, then press the **Set Up** key. The set up screen then displays as shown in the example below.

```
        SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU (Version x.xx xx/xx/xx)

------- Clock ---------------   ----Communication---  ------ Printer --------
Time: 03:16:54                  COM1: Internal Modem  Interface:      Parallel
Date: Sat March 21  1987        COM2: Not Present     Port Address:       3BCh

------- Power ---------------   -COM1: Internal Modem
On Condition:       None        Baud Rate:    1200
                                Data Bits:       8
                                Stop Bits:       1
------- Display -------------   Parity:       None    ------ System ---------
Display Mode:      Graphics     Mode:         Modem   Speed:          Standard
Cursor Blink:      2/second     DTR/CD:       Enable  Key Click:           Off
Cursor Type:       Underline    Auto Answer:  Yes     Console·             CGA
Character Blink:   1/second                          Drive A·  Internal 3.5"
Background:        Standard
Backlight:           On
Backlight Timeout:  2 minutes                        Default Setup:       F1

 1. Position Cursor              2. Press Spacebar          3. Press Set Up key
    using cursor keypad             to change                  to Update and Exit
```

Notice the setting for the modem in the middle of the screen.

Also, notice the COM1 or COM2 setting is "Internal Modem".

The selection for the function, modem or serial I/O, can be made in the Mode field.

The following is a description of the internal modem/internal SIO settings that control the CE-451M modem card. (If you need instructions on moving around this screen and making changes, see Chapter 4.)

Baud Rate. The possible settings are: 110, 150, 300, or 1200 (Modem mode), or 110, 150, 300, 600, 1200, 2400, 4800, or 9600 (SIO mode).

Data Bits. The possible settings are: 7 or 8.

Stop Bits. The possible settings are: 1 or 2.

Parity. The possible settings are: None, Even, or Odd.

Mode. The possible settings are: Modem or SIO.

The next two fields are valid in the modem mode only.

DTR/CD. The possible settings are: Override or Enable. Setting this field to Override causes the modem card to override the RS-232C DTR (Data Terminal Ready) and CD (Carrier Detect) signals and assume them to be always on (logic true). This setting makes the modem card always available. Setting this field to Enable causes the modem card to be controlled by the DTR and CD signals. This setting disables the modem card when the power to the main unit is turned off, or makes it hang up when the DTR or CD signal is set to off (false logic).

Auto Answer. This field indicates if the automatic answer feature is on or off. The possible settings are: Yes or No.

Also, you can get additional selections in the On Condition field in the Power category.

Ringing. Power is automatically turned on to the computer when the telephone rings.

Alarm RI. Power is automatically turned on to the computer when the telephone rings or when the specified time comes.

Device Indicator

When installing communications software, you may be asked to identify the type of modem being used. The CE-451M modem card has basically the same functions as the Hayes Smartmodem* and utilizes the COM1 or COM2 port.

CAUTION: When connecting an external device to the modem or serial connector, set the mode in advance.

Note: When the CE-451M is installed and no external device is connected, set the mode to SIO to reduce the power consumption.

Using the Modem

Once the modem card is properly installed, you can begin to use the modem to communicate with remote devices. In order to access the modem, you must use an appropriate communications software application. The software provides specific instructions for data transmission.

Some communications applications provide a series of menus that simplify the set up and transmission procedure. Other applications allow you to access the modem directly using command set conforming to that of Hayes*.

Data/Command Mode. Once the modem is activated, it is ready to perform in one of two modes – data or command. In the data mode, information is transferred across telephone lines to a remote device. In the command mode, commands are sent to the modem. When the system is in a terminal state and a telephone connection has not been made, commands may be entered from the keyboard or under program control.

When the system is placed online, the data mode is in effect until the telephone connection is terminated or an escape code is entered. See command summary and registers for more information on changing modes.

Command Lines. In the command mode, you can enter a command line to instruct the modem to carry out various tasks. Observe the following rules when entering command strings:

* Always begin a command line with "AT" except "A/".

* "AT" must be entered in uppercase; all other portions of the command line can be in upper or lower case.

* Always leave one blank space after "AT" in a command line.

* A backspace character (determined by register 5) deletes the previous character in a command line.

* A carriage return character (determined by register 3) must always be entered at the end of a command line.

* The maximum length for a command line 40 characters. The "AT," control characters, and spaces are not counted.

Result Codes. Result codes are responses that the modem provides to your commands. The following is a list of possible result codes:

Note:
Result codes 0 to 4 – enabled if ATX0 is selected.
Result codes 0 to 5 – enabled if ATX1 is selected and S17 bit 5 = 0
Result codes 0 to 12 – enabled if ATX1 is selected and S17 bit 5 = 1

* OK – Command executed without error (digit code 0).

* CONNECT – Connection established (digit code 1).

* RING – Incoming ring detected (digit code 2).

* NO CARRIER – a) Failure to connect or loss of carrier.
b) User aborst during dialing. (digit code 3)

* ERROR a) Error detected in command line.
b) Command string greater than 40 characters (digit code 4).

* CONNECT 1200 – Connection established 1200 baud (digit code 5).

* BUSY – Called number is busy (digit code 6).

* RINGING – Called number is ringing (digit code 7).

* DISCONNECTING – Long space disconnect is being sent (digit code 8).

* RDL FAILURE – Attempt to enter RDL mode failed (digit code 9).

* RDL READY – RDL mode entered (digit code 10).

* REMOTE LOOP – Looping received data back to remote modem (digit code 11).

* DIAL TONE – Dial tone detected (digit code 12).

Dialing. Dialing a remote device is started in the command mode using the "D" command. Observe the following rules when dialing a remote device:

* The character " , " in a dialing command is used to pause between digits of a telephone number.

* The character " ; " in a dialing command is used to return to the command mode after dialing.

* The characters ( ) – . and <SPACE> are ignored by the modem, but may be used for readability.

The following is an example of a command line to dial a remote modem:

```
AT DT  1-617-555-1212;
```

In this example, the modem is instructed to dial (D) in a touch-tone (T) and return to the command mode (;) after dialing the telephone number (1-617-555-1212).

Command Summary. The following is a summary of all commands available in the command mode:

*** A – Answer**
This command causes the modem to answer an incoming call.

*** A/ – Re-execute last command**
This command is used to repeat the previous command line. Do not start this command with "AT".

*** C – Carrier Control**
This command controls the carrier.
C0: Carrier disabled.
C1: Carrier enabled. (default)

*** D – Dial Command**

This command instructs the modem to begin dialing. It is usually followed by dialing instructions.

*** E – Command Echo**

This command controls the command echo.

E0: Disables any local echo (characters displayed on the screen) while in the command mode.

E1: Enables a local echo while in the command mode. (default)

*** F – Duplex Command**

This command enables the half duplex or full duplex.

F0: Echo transmit data when online. (half duplex)

F1: Full duplex (default)

*** H – Hook Command**

This command instructs the modem to place the telephone hook on and off.

H0: Go on-hook (default)

H1: Go off-hook

H2: Go off-hook (same as H1)

*** I – Identification Command**

I0: Sends "123" identification.

I1: Sends a check sum value.

I2: Same as I1.

*** M – Speaker Control**

M0: Speaker always off

M1: Speaker on until carrier detected (default)

M2: Speaker always off

*** O – Online or Originate**

This command instructs the modem to return to the data mode, after an escape code was entered.

*** P – Select Pulse Dial**
This command causes all subsequent digits to be pulse-dialed.

*** Q – Result Code Control**
Q0: Result code enabled. (default)
Q1: Result code disabled.

*** Sr? – Inquire S Register Command**
This command displays the contents of register "r" as a decimal number.

*** Sr = n – Set Register Command**
This command sets the contents of register "r" with the decimal value "n".

*** T – Select Tone Dial**
This command causes all subsequent digits to be dialed in touch-tones.

*** V – Verbose or Terse Response codes**
V0: Result code is digit.
V1: Result code is word. (default)

*** X – Response codes enable**
X0: AT 300 compatible responses. (default)
X1: Extended responses enabled.

*** Z – Modem reset**
This command instructs the modem to restart the software, return to power-on values, and clear the command line.

Registers. When the modem is in the command mode, there are 19 registers that can be accessed to control certain aspects of the modem.

These registers are labeled S0 through S18 and control the following functions:

*** S0 – Rings to Answer**
Controls the number of rings on which the modem automatically answers an incoming call. Acceptable entries range from 0 to 255. A 0 disables automatic answering. The default entry is 0.

*** S1 – Ring count**
Indicates the number of rings that have occurred. Acceptable entries range from 0 to 255. The default is 0.

*** S2 – Escape Code Character**
Determines the character used to change from data mode to command mode. Acceptable entries range from 0 to 255 decimal. Values greater than 127 decimal will disable the function. The default is 43 decimal, the "+".

*** S3 – Carriage Return Character**
Determines the character used to end a command line. Acceptable entries range from 0 to 127 decimal. The default is 13 decimal.

*** S4 – Line Feed Character**
Automatically adds line feed character after result codes. Acceptable entries range from 0 to 127. The default is 10 decimal.

*** S5 – Back Space Character**
Determines the backspace character used to delete a character in the command line. Acceptable entries range from 0 to 32 and 127. The default is 8 decimal.

*** S6 – Wait for Dial Tone**
Determines the number of seconds between taking the phone off the hook and dialing the first digit of the telephone number. Acceptable entries range from 2 to 255. The default is 2.

*** S7 – Wait for Carrier after Dial**
Determines the delay in seconds between finishing dialing and failing to detect a carrier. If the modem does not detect a carrier within the delay period, the modem hangs up and returns a no carrier result code. Acceptable entries range from 1 to 255. The default is 30.

*** S8 – Dial Pulse Time**
Determines the delay in seconds when a " , " is added to the telephone number. Acceptable entries range from 0 to 255. The default is 2.

*** S9 – Carrier Detect Response Time**
Determines the time in tenths of a second a carrier must be present before it is recognized by the modem. This value is 6 (600 mS) and is not programmable.

*** S10 – Loss of Carrier Response Time**
Determines the time in tenths of a second between loss of a carrier and a disconnect by the modem. Acceptable entries range from 1 to 255. The default is 14.

*** S11 – Touch Tone Duration**
Determines the dialing rate in milliseconds. Acceptable entries range from 50 to 255. The default is 70.

*** S12 – Escape Code Guard Time**
Determines the guard time in fiftieths of a second required before and after entering the escape sequence. If the guard time is not met, the escape sequence is assumed to be part of the message being sent. Acceptable entries range from 20 to 255. The default is 50.

*** S13 – Bit Mapped Register**

Bit 0: 9th data bit value
Bit 1: Extended result code status (ATX)
Bit 2: 0 = Parity disabled
1 = Parity enabled
Bit 3: 0 = Odd parity
1 = Even parity
Bit 5, 4: 00 = 7 data bits
01 = 8 data bits
10 = 9 data bits
Bit 6: 0 = Buffer not full
1 = Buffer overflow detected
Bit 7: 0 = Space parity
1 = Mark parity

*** S14 – Bit Mapped Register**

Bit 0: Not used
Bit 1: 0 = No echo (ATE0)
1 = Echo (ATE1)
Bit 2: 0 = Result code enabled (ATQ0)
1 = Result code disabled (ATQ1)
Bit 3: 0 = Result code is digit (ATV0)
1 = Result code is word (ATV1)
Bit 4: Always zero
Bit 5: 0 = Pulse dialing
1 = Tone dialing
Bit 7, 6: 00 = Speaker always off (ATM0)
01 = Speaker on until carrier detected (ATM1)
10 = Speaker always on (ATM2)

*** S15 – Bit Mapped Register**

Bit 0: Same as bit 4
Bit 1: Same as bit 5
Bit 2: 0 = Answer
1 = Originate
Bit 3: 0 = Half duplex (ATF0)
1 = Full duplex (ATF1)

Bit 5, 4: 00 = Undefined
01 = 110 baud
10 = 300 baud
11 = 1200 baud

Bit 6: 0 = Carrier off
1 = Carrier on

Bit 7: Not used

*** S16 – Test Register**

S16 = 0: Normal operation
S16 = 1: Enables analog loopback
S16 = 2: Enables DTMF tone test
S16 = 3: Invoke digital loopback mode
S16 = 4: Requests remote digital loopback

*** S17 – Bit Mapped Register**

Bit 0: Not used (must be zero)

Bit 1: Not used (must be zero)

Bit 2: 0 = Force CXR always on
1 = Normal CXR
This bit controls the CXR status line. If this bit is set to 0 then the CXR status line will always be on. If this bit is set to 1 then the CXR status line will follow the true carrier status. For normal operation, this bit should be set to 1.

Bit 3: Not used

Bit 4: 0 = Force DTR always on
1 = Normal DTR
This bit controls function of the DTR line. If this bit is set to 0 then DTR is not required to go ONLINE. If this bit is set to 1 then DTR must be ON to go ONLINE. For normal operation, this bit should be set to 1.

Bit 5: Enables Call progress monitoring
This bit controls the call progress monitoring function. If this bit is equal to 1 then call progress monitoring is enabled.

Bit 6: Enables Send long space on disconnect
This bit controls the Send long space disconnect option. If this bit is equal to 1 then upon disconnect, the modem will send 4 seconds of space prior to disconnect. This bit is normally set to 0.

Bit 7: Enables disconnect on long space receipt
This bit controls the receive Long space disconnect option. If this bit is equal to 1 then upon receiving 1.5 seconds of space, the modem will disconnect the call. This bit is normally set to 0.

*** S18 – Bit Mapped Register**

Bit 0: Modem transmit disable
This bit shows the status of the ATC command.

Bit 1: Disable low speed operation on answer
If this bit is set to 1, the modem will only connect with another 1200 baud modem in answer mode. This bit is normally set to 0.

Bit 2: CXR internal state

Bit 3: CTS internal state

Bit 4: Enable Response to remote test
If this bit is set to 1 then the modem will respond to a remote digital loopback request. This bit is normally set to 0.

Bit 5: Not used

Bit 6: Not used

Bit 7: Not used

To make an entry into a register, in the command mode, enter "Sr = n" where "r" is the register number and "n" is the new value. For example, the entry shown below would result in an automatic answer on the fourth ring.

```
AT S0=4
```

External Floppy Disk Drive Unit

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External Floppy Disk Drive Unit

Overview

This chapter describes how to use the CE-452F external 5-1/4" floppy disk drive unit with your computer.

The first section describes how to set up the CE-452F.

The second section describes how to use the CE-452F.

The third section describes 5-1/4 inch floppy diskettes.

Setting Up

Picking a Location

Begin setting up the CE-452F by picking a location for its use. While the CE-452F can fit in a very small area, certain guidelines should be followed so that it can be operated comfortably and safely.

Be sure the spot you pick to set up and run the CE-452F meets the following environmental requirements.

Surface. Pick a hard, flat surface on which to set up and operate the CE-452F. Using the CE-452F on a bed or rug restricts the air circulation and could result in static electricity affecting the performance of the system. A table or desk near the main unit is the best choice.

Temperature. Operate the CE-452F in temperatures between 10 degrees C (50 degrees F) and 35 degrees C (95 degrees F). Operating in extreme temperatures could damage the CE-452F.

Humidity. Operate the CE-452F in humidity levels under 80 percent. Excessive moisture can damage the CE-452F.

The following electrical requirements must be considered when picking a spot for the CE-452F.

Power Supply. The CE-452F runs on the AC current of local voltage. It must be plugged into a grounded outlet.

WARNING: *This equipment must be electrically grounded. It is equipped with a power cord that is plugged into a grounded outlet. You could severely damage the CE-452F if you fail to use an appropriately grounded outlet.*

Interface Cable. The CE-452F comes with an interface cable to be connected to the computer.

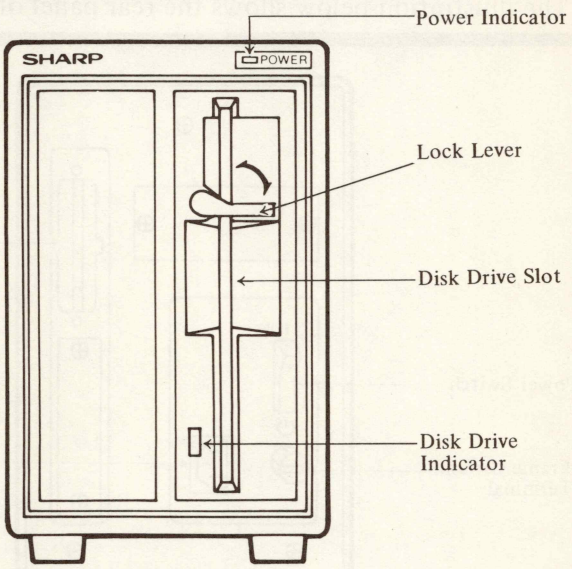
It is approximately 1 m (3-1/4 feet) long. Be sure you are within reach of the computer's left side panel when you pick a location.

Interference. It is possible that radio and television interference can occur when running the CE-452F, even if it is installed properly. Therefore, use the equipment away from radios and televisions.

If you suspect that the equipment is still causing interference, try plugging the equipment into an electrical circuit other than the one used for the radio and television.

Front Panel

The illustration below shows the front panel of the CE-452F floppy disk drive unit.



Disk Drive Slot. Insert a 5-1/4" floppy diskette into this slot.

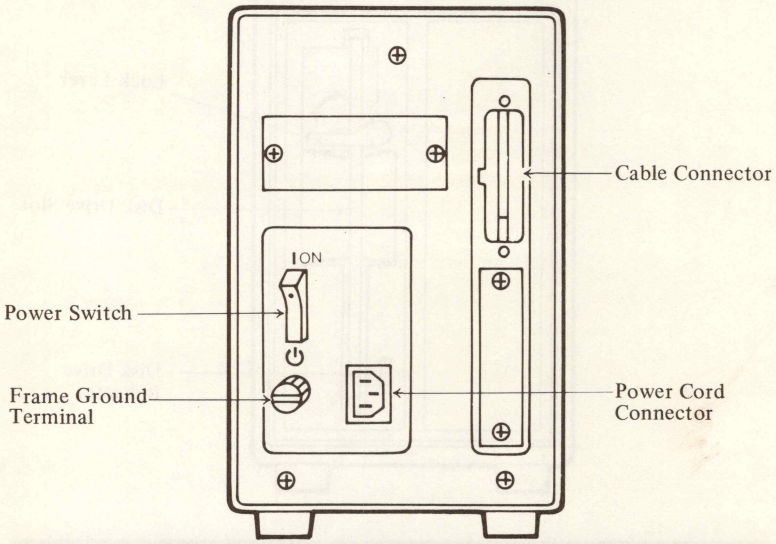
Lock Lever. Turn this lever horizontally to lock a diskette into the drive unit. To remove the diskette turn it back to the vertical position.

Disk Drive Indicator. To the lower left of the disk drive slot is a disk drive indicator. It illuminates when the system is accessing the external floppy disk drive unit.

Power Indicator. Located at the top of the front panel is the power indicator. When power is turned on to the CE-452F, this indicator illuminates.

Rear Panel

The illustration below shows the rear panel of the CE-452F.



Cable Connector. On the upper right of the rear panel is the cable connector, used to connect the interface cable.

Power Cord Connector. Connect the female end of the power cord to this connector and male end to the grounded wall outlet.

Power Switch. To turn on the CE-452F, press this switch to the "ON" position. To turn off the CE-452F, press the switch to the " ⏻ " position.

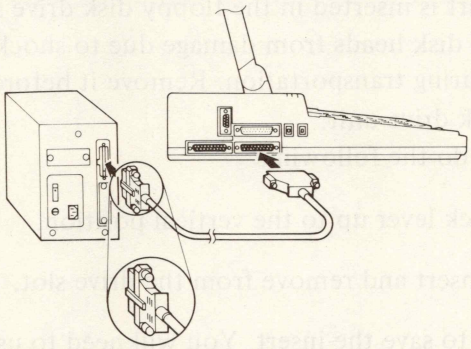
Frame Ground Terminal. If a ground is necessary, connect a ground wire to this terminal.

Setting Up

To set up the CE-452F external 5-1/4" floppy disk drive unit for operation, do the following:

1. Turn off power to the main unit.

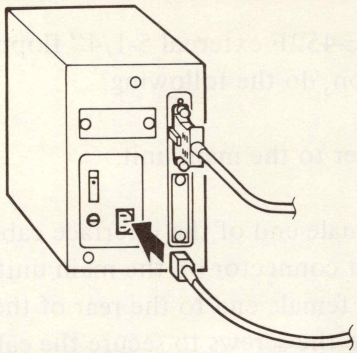
2. Connect the male end of the interface cable to the floppy disk drive unit connector on the main units left side panel and the female end to the rear of the floppy disk drive unit. Use the screws to secure the cable to the main unit and floppy disk drive unit.



Note: Before connecting the cable, remove the dust cap from the floppy disk drive unit connector and save it for future use.

3. Connect the female end of the floppy disk drive power cord into the rear panel of the floppy disk drive unit and the male end to the grounded AC outlet.

CAUTION: Before connecting the power cord, be sure that both the main unit and the floppy disk drive unit are turned off.



Remove Travel Insert

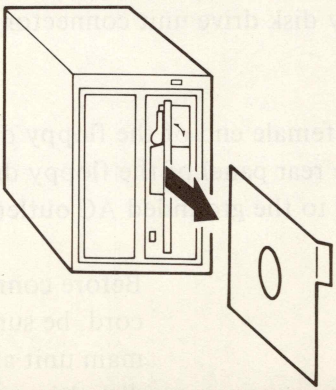
The travel insert is inserted in the floppy disk drive slot. It protects the disk heads from damage due to shock or vibration during transportation. Remove it before using the floppy disk drive unit.

To remove, do the following:

1. Turn the lock lever up to the vertical position.

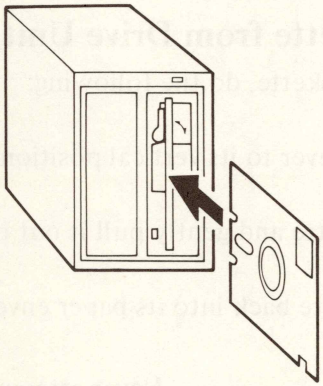
2. Grasp the insert and remove from the drive slot.

Note: Be sure to save the insert. You will need to use it again whenever you transport the CE-452F.



Insert Diskette into Drive Unit

The illustration below shows how to insert a floppy diskette into a drive.



To insert a diskette, do the following:

1. Be sure the lock lever is turned to its vertical position.

2. Remove the diskette from its paper envelope.

3. Grasp the diskette by the top and insert into the drive slot so that the diskette label is facing the left.

4. Gently push the diskette into the slot until it comes to a stop.

5. Turn the lock lever to its horizontal position to lock the diskette in place.

Your CE-452F is now ready for operation. When using, turn on the CE-452F first, then the computer. When you finish working, turn off the computer first, then the CE-452F. If you power on or off in the wrong order, the floppy disk drive unit may not work properly.

Remove Diskette from Drive Unit

To remove a diskette, do the following:

1. Turn the lock lever to its vertical position.

2. Grasp the diskette and gently pull it out of the drive unit.

3. Place the diskette back into its paper envelope.

CAUTION: Never attempt to remove a diskette from a disk drive when the disk drive indicator light on the CE-452F is illuminated. This may cause damage to the contents of the diskette.

Using the CE-452F

This section describes how to use the CE-452F external floppy disk drive unit with your computer.

Drive Designator

Usually, the external 5-1/4 inch floppy disk drive is assigned as drive C. If you have no diskette in drive A, the system can be loaded from drive C. You can change the drive assignments A and C using the set up function described below.

Set Up Functions

If you want to change the drive assignment, a certain set up function setting needs to be made. First, turn on power to the CE-452F, then the computer. Then access the set up screen and locate the Drive A field in the System category.

```
        SHARP PERSONAL COMPUTER SYSTEM SET-UP MENU  (Version x.xx xx/xx/xx)

------- Clock ---------------   ----Communication---  ------ Printer --------
Time: 03:16:54                  COM1: Not Present     Interface:      Parallel
Date: Sat March 21  1987        COM2: Not Present     Port Address:       3BCh

------- Power ---------------
On Condition: None


------- Display -------------                         ------ System ---------
Display Mode:       Graphics                          Speed:           Standard
Cursor Blink:       2/second                          Key Click:            Off
Cursor Type:        Underline                         Console:              CGA
Character Blink:    1/second                          Drive A:  Internal 3.5"
Background:         Standard
Backlight:           On
Backlight Timeout:  2 minutes                         Default Setup:        F1


 1. Position Cursor          2. Press Spacebar          3. Press Set Up key
    using cursor keypad         to change                  to Update and Exit
```

Press **Space Bar** to change this field to "External 5.25" ". Then press **Set up** and then **Enter**. The computer will be re-started and load MS-DOS* from the CE-452F external floppy disk drive unit.
Note the internal 3-1/2 inch drive is assigned as drive C and the external 5-1/4 inch drive as drive A.

Transferring Data

Data can be transferred to or from the 5-1/4 inch floppy disk drive. When transferring data, however, do not use the DISKCOPY command. Instead, format the target diskette and then use the COPY command to transfer data.
To copy an entire diskette from 3-1/2 inch to 5-1/4 inch, the MS-DOS* command would be:

```
A>COPY *.* C:
```

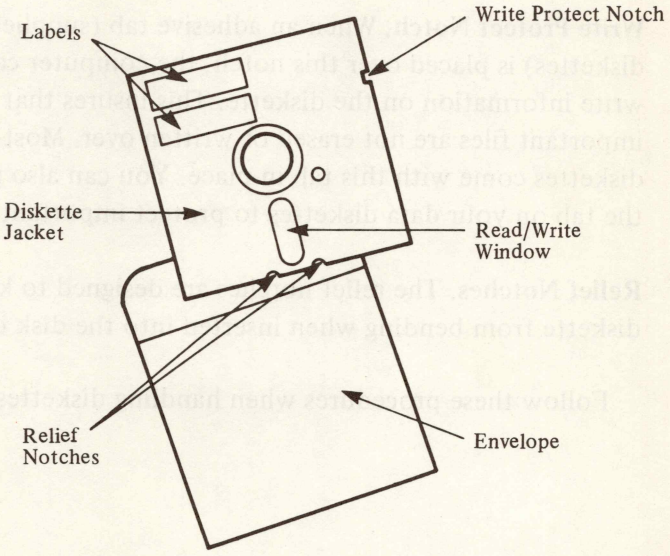
The Diskettes

The CE-452F uses 5-1/4 inch, double-sided, double density diskettes that store up to 360K of information.

Diskette Handling Procedures

To safeguard information stored on diskette, it is important that you handle diskettes with care.

The illustration below shows what a typical diskette looks like.



Envelope. The envelope protects the exposed areas of the diskette. Always return the diskette to its envelope after use.

Diskette Jacket. The diskette itself is permanently encased in a jacket to protect its magnetic surface. Never remove this jacket.

Label. The label identifies the content of the diskette. When you purchase blank diskettes, there is usually a place provided on the label for identifying the content of the diskette.

Read/Write Window. The read/write window allows the disk head to read from and write to the diskette. Never touch this area.

Write Protect Notch. When an adhesive tab (supplied with diskettes) is placed over this notch, the computer can not write information on the diskette. This insures that important files are not erased or written over. Most program diskettes come with this tab in place. You can also place the tab on your data diskettes to protect important files.

Relief Notches. The relief notches are designed to keep the diskette from bending when inserted into the disk drive unit.

Follow these procedures when handling diskettes:

- Never touch any exposed area of the diskette.
- Always return the diskette to its paper envelope after use.
- Never bend or twist the diskette.
- Never expose the diskette to liquids. If you spill a liquid on the diskette, throw the diskette away.
- Never expose diskettes to excessive heat or direct sunlight.
- Always keep diskettes at least 3 meters (10 feet) away from magnetic fields such as those in electronic equipment and telephones.
- Always store diskettes in a cool, dry, dust free area, in an upright position.
- Never place heavy objects such as books on the diskettes.
- When labelling your diskettes, always use a felt-tipped pen. Do not use a ballpoint pen or pencil.
- Always remove diskettes from the disk drive after use. Never leave diskettes partially inserted in a disk drive.

Appendices

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Overview

This chapter contains five appendices covering a wide range of information.

The first appendix describes general maintenance activities you can perform to keep the system functioning at peak performance.

The second appendix describes how to diagnose problems on the computer including using the Diagnostic Program.

The third appendix is a GW-BASIC quick reference.

The fourth appendix is a troubleshooting chart to help you quickly solve problems.

The fifth appendix contains detailed specifications of the system including pin layout descriptions.

The sixth appendix is a glossary of terms used in this manual.

General Maintenance

There are certain general maintenance activities you can perform from time to time to keep your computer clean and operating at its utmost efficiency.

Preventative Maintenance

The computer is a sophisticated instrument containing many sensitive components. It should be handled with care. Here are some steps you can take to prevent damage to the system:

- Never expose the system to a harsh environment such as those containing rapid temperature changes or excessive dust.
- Never expose the system to excessive vibration.
- Prevent overheating by keeping the system's air vents clear of any obstructions. Never place anything on top of the system because this can also cause overheating.

CAUTION: If there is any evidence of overheating (smoke, abnormal smell, etc.), immediately unplug the main unit's AC adaptor plug and contact your Sharp dealer.

- Do not use a power source where currents excessively fluctuate.

Dusting

It is important to keep the system free from dust. To dust the system, apply a small amount of dust remover to a dry, lint-free cloth. Rub the outside surfaces with the cloth, making especially certain that the air vents on the left side and rear panels are clear of dust.

Never use alcohol, benzine, thinner or other powerful substances that could damage the system's surface.

Cleaning Screen

The plastic screen may smudge or get dusty. To clean the screen's surface, gently rub it with a dry, lint-free cloth. Never use alcohol, benzine, thinner or other powerful substances, or a wet cloth to clean the screen's surface.

Notes: 1. Avoid touching the screen with your fingers when using the computer.

2. Do not spray cleaning fluid directly onto the casing or screen.

Battery Maintenance

To maintain the lead battery, observe the following requirements.

1. The battery charge may be lost due to self-discharge during transit.

   Charge the battery for about 8 hours before use.

2. Whenever the low battery indicator lights during use, recharge the battery as soon as possible.

3. If you use the computer without recharging the battery after the low battery indicator lights, the computer is automatically turned off to prevent overdischarge of battery and to protect the computer hardware.

4. If the computer is stored for a long time, recharge the battery every 6 months so as to prevent deterioration due to self-discharge.

CAUTIONS:

1. Do not place the battery near excessive heat or fire. Do not short-circuit the battery. The battery may burst if these conditions occur.

2. Do not disassemble the battery. Whenever the battery casing is broken and its electrolyte contacts your skin or clothes, wash away with water. If electrolyte enters your eye, wash your eye with fresh water, and consult a doctor without delay.

3. To clean the battery, wipe it with dry cotton cloth. Never use chemical fiber cloth.

4. Keep the battery from organic solvent, such as gasoline and thinner, and plasticizer for synthetic resins, oils, etc.

Diagnostics

This section describes procedures you can follow if you suspect that one of the components of your computer is malfunctioning.

Power-On Diagnostics

When the system's power is turned on, an automatic self-test routine is started. The system does the following:

1. When power is turned on, the following message displays on the screen:

```
The Sharp Personal Computer System
Firmware Version x.xx
Copyright (C) 1987 by Sharp Corporation
Copyright (c) 86, 87 by Vadem, Inc.

Processor      Passed.
Firmware ROM   Passed.
Keyboard       Passed.
Clock          Passed.
Setup RAM      Passed.
xxxK Memory.

Loading A:
```

2. After a few seconds, MS-DOS* is loaded, and the following displays:

```
The Sharp Personal Computer System
I/O Subsystem Version x.xx
Copyright (C) 1985, 1986, 1987 by Vadem Inc.
All Rights Reserved.

A>PATH \

A>VER

MS-DOS Version 3.21

A>
A>
```

If the system cannot load MS-DOS*, the following message appears:

```
Loading A: ....... Error !

Diskette Drive Empty...
Please Insert a System Disk and Press any key:_
```

Simply insert an MS-DOS* diskette in drive A and press any key.

If the power-on diagnostics routine does not function as described above, call your Sharp dealer.

Diagnostics Program

If the power-on diagnostic routine functions correctly, but you still suspect problems, use the diagnostic program on the MS-DOS* diskette.

The diagnostics program contains the following segments:

- Real Time Clock & Setup RAM
- Memory
- Keyboard
- Monochrome Adaptor
- Color Graphics Adaptor
- Floppy Disk Drive
- Printer
- Hard Disk Drive

Also the diagnostic program contains the hardware installation program to judge whether the reserved devices are attached to the main unit.
During these segments, text and graphics appear on the screen. If the program finds any problems, error messages are displayed. If an error message appears, call your Sharp dealer.

Diagnostic Program Start Up. To run the diagnostic program, insert the MS-DOS* diskette in drive A and turn on the power to the main unit. Then enter the command as shown below at the MS-DOS* prompt and press the **Enter** key.

```
A>DIAG45U
```

After several seconds, the diagnostic program is started and the following message appears on the screen:

```
DIAGNOTIC PROGRAM   V-x.xx

1 --- Real Time Clock & Setup RAM
2 --- Memory
3 --- Keyboard
4 --- Monochrome Adaptor
5 --- Color/Graphics Adaptor
6 --- Floppy Disk Drive
7 --- Printer
8 --- Hard Disk Drive
9 --- Run all above tests

0 --- Hardware Installation

Enter your selected number:_
```

Type the number of the item you want to test and press the **Enter** key.

Real Time Clock & Setup RAM. This section automatically checks the real time clock and setup RAM. This test checks if the clock works correctly, and reads/writes the data from/ to the battery backed-up memory for the set up function.

Memory. This section automatically begins a test of the main memory. If a memory error is detected, an error message displays.

Keyboard. This section is the keyboard test that begins with an image of the keyboard displaying on the screen. To test the performance of a key, simply press the key in question. A square should display on the keytop image for each key despressed.

Monochrome Adaptor. This section checks the monochrome display adaptor board. When this section is selected, the following appears on the screen:

```
Monochrome Adaptor Check

1 --- Monochrome display buffer check
2 --- Attribute check
3 --- Character set check
4 --- B/W mode check
5 --- Run all above checks

0 --- Exit

Enter your selected number:_
```

Note: When you select this test without setting the console on the set up screen to MDA, a warning message appears.

1. Monochrome Display Buffer Check
   Checks the buffer in the monochrome adaptor.

2. Attribute Check
   Displays the possible attributes in the monochrome mode: Normal, Intensity, Reverse, Blink, and Underline.

3. Character Set Check
   Displays characters on the screen normally and then highlighted.

4. B/W Mode Check
   Displays the black and white mode of the monochrome adaptor. Two patterns, all black and then all white, appear on the screen.

5. Run All Above Check
   Checks all the items from 1 to 4 in sequence.

Press **0** to exit this section and return to the menu. If a defect is detected, call your Sharp dealer.

Color/Graphics Adaptor. This section checks the color/graphics adaptor. When this section is selected, the following appears on the display:

```
Color/Graphics Adaptor Check

1 --- Color/graphics display buffer check
2 --- Attribute check
3 --- 80x25 alphanumeric mode check
4 --- 40x25 alphanumeric mode check
5 --- 320x200 graphics mode check
6 --- 640x200 graphics mode check
7 --- Screen paging check
8 --- Color CRT check
9 --- Run all above checks

0 --- Exit


Enter your selected number:_
```

Note: When you select this test without setting the console on the set up screen to CGA, a warning message appears.

1. Color/Graphics Display Buffer Check
   Checks the buffer in the color/graphics adaptor.

2. Attribute Check
   Displays 16 colors for the characters, 8 colors for background, and also displays 8 colors in blink.

3. 80 x 25 Alphanumeric Mode Check
   Displays characters on the screen normally and then highlighted in the 80 x 25 alphanumeric mode.

4. 40 x 25 Alphanumeric Mode Check
   Displays characters on the screen normally and then highlighted in the 40 x 25 alphanumeric mode.

5. 320 x 200 Graphics Mode Check
   Displays two patterns of color graphics in the 320 x 200 graphics mode.

6. 640 x 200 Graphics Mode Check
   Displays a pattern of monochrome graphics in the 640 x 200 graphics mode.

7. Screen Paging Check
   Displays the 8 pages of the color/graphics adaptor. Each page is filled with numbers from 0 to 7 corresponding to the page number and the number changes by pressing any key.

8. Color CRT Check
   Displays each of the 16 colors painted on the entire screen one by one. The color changes by pressing any key.

9. Run All Above Check
   Checks all the items from 1 to 8 in sequence.

Press **0** to exit this section and return to the menu.
If a defect is detected, call your Sharp dealer.

Floppy Disk Drive. This section is a test to determine any defects in the read/write operation of your floppy disk drive.

CAUTION: Data on the diskette in the drive you check may be erased during this section. Be sure the diskette to be tested contains no important files.

When this test is selected, the following appears on the display:

```
Floppy Disk Drive Check

1 --- Seek check
2 --- Write, read check

0 --- Exit

Enter your selected number:_
```

When a number is entered, the system asks you which drive to be tested. Insert a formatted diskette in the drive to be tested, type **A, B**, or **C** and then press **Enter**.

1. Seek Check
   Checks if the read operation is performed correctly while increasing/decreasing the track counter.

2. Write, Read Check
   Checks if the floppy disk drive read/write operation is performed correctly by comparing data written to the diskette with data read from the diskette. This test destroys all the data on the diskette.

   If a problem is detected during the test, an error message displays.

Printer. This section tests the printer attached to the main unit. When this section is selected, the following appears on the display:

```
Printer Check

1 --- Printer status check
2 --- Character set check

0 --- Exit

Enter your selected number:_
```

When you select 1, the printer status is displayed on the screen. The following status categories are checked:

- Bsy – indicates if the printer is not busy
- Ack – indicates if the printer can communicate with the main unit
- Pe – indicates if paper is loaded into the printer
- Sel – indicates if the printer selection signal is on
- Ioe – indicates if the printer is free of mechanical problems
- Toe – indicates if the printer interface is functioning properly

In order to execute the character set check, an asterisk must appear below each category. Otherwise, an error message appears and the printer status appears on the screen. For example, if there is no asterisk under Pe, load paper into the printer. The asterisk should then display. If a true hardware malfunction is detected, you will not be able to obtain an asterisk in that category. Note the problem and contact your dealer.

Once all categories contain asterisks, press any key. The system returns to the menu shown above. Retry the character set check again. A test pattern is printed. If a problem is detected, an error message displays and the test is stopped.

Hard Disk Drive. This section is a test to determine any defects in the read/write operation of your hard disk drive.

CAUTION: Data on the hard disk drive may be destroyed.

When this section is selected, the following appears on the display:

```
Hard Disk Drive Check

1 --- Seek check
2 --- Write, read check

0 --- Fxit

Enter your selected number:_
```

Be sure that the hard disk has no important files, type the number, and then press **Enter.** The system displays a warning message. Answer Y to the prompt.

1. Seek Check
   Checks if the read operation is performed correctly while increasing/decreasing the cylinder counter.

2. Write-read Check
   Checks if the hard disk drive read/write operation is performed correctly by comparing data written to the hard disk with data read from the hard disk.

CAUTION: This test destroys all the data on the hard disk.

If a problem is detected during the test, an error message displays.

Run all above tests. When this item is selected, all the tests from 1 to 8 are performed sequentially.

Hardware Installation. When this item is selected, all the installed devices appear on the screen. The following are the names of possible devices:

```
Hardward Installation

 System Board
 Real Time Clock & Setup RAM
 Main Memory (indicated by kilobytes)
 EMS Memory
 ROM File Memory
 Keyboard
 Liquid Crystal Display
 Monochrome CRT Adaptor
 Color/Graphics CRT Adaptor
 1, 2, or 3 Floppy Disk Drive(s) Adaptor
 Printer Adaptor
 Serial Port Adaptor
 Hard Disk Drive (PC-4521 only)
```

If a device is connected to the main unit and it does not appear in the list, that device may be faulty.

GW-BASIC Quick Reference

This appendix is the **GW-BASIC** quick reference. For details on each command, see the optional GW-BASIC Manual.

NAME SYNTAX

ABS ABS (X)
Returns the absolute value of the expression X.

ASC ASC (X$)
Returns a numerical value that is the ASCII code for the first character of the string X$.

ATN ATN (X)
Returns the arctangent of X, where X is in radians.

AUTO AUTO [⟨line number⟩] [, [⟨increment⟩]]
Automatically generates line numbers during program entry.

BEEP BEEP
Sounds the speaker.

BLOAD BLOAD ⟨filename⟩ [, ⟨offset⟩]
Loads a specified memory image file into memory from any input device.

BSAVE BSAVE ⟨filename⟩, ⟨offset⟩, ⟨length⟩
Transfers the contents of the specified area of memory to any output device.

CALL CALL ⟨variable name⟩ [(⟨argument list⟩)]
Calls an assembly language subroutine or a compiled routine written in another high level language.

CALLS CALLS ⟨variable name⟩ [(⟨argument list⟩)]
Calls an assembly language subroutine or a compiled routine written in another high level language.

CDBL CDBL (X)
Converts X to a double precision number.

CHAIN CHAIN [MERGE] ⟨filename⟩ [, [⟨line number exp⟩] [, ALL] [, DELETE ⟨range⟩]]
Calls a program and passes variables to it from the current program.

CHDIR CHDIR ⟨path⟩
Changes the current directory.

**CHR$** CHR$ (I)
Returns a string whose one character is ASCII character I.

CINT CINT (X)
Converts X to an integer by rounding the fractional portion.

CIRCLE CIRCLE [STEP] (⟨x center⟩, ⟨y center⟩), ⟨radius⟩ [, ⟨color⟩ [, ⟨start⟩, ⟨end⟩ [, ⟨aspect⟩]]]
Draws an ellipse or circle with the specified center and radius.

CLEAR CLEAR [, [⟨location⟩] [, ⟨stack⟩]]
Sets all numeric variables to zero, all string variables to null, and closes all open files.

CLOSE CLOSE [[#] ⟨file number⟩ [, [#] ⟨file number...⟩]]
Concludes I/O to a file.

CLS CLS [0/1/2]
Erases contents of entire current screen.

COLOR COLOR [⟨foreground⟩] [, [⟨background⟩] [, ⟨border⟩]]
COLOR [⟨background⟩] [, [⟨palette⟩]]
COLOR [⟨foreground⟩] [, [⟨background⟩]]
Allows you to select the foreground and background colors for the display.

COM COM (n) [ON/OFF/STOP]
Enables or disables event trapping of communications activity on the specified port.

COMMON COMMON ⟨list of variables⟩
Passes variables to a chained program.

CONT CONT
Continues program execution after a **Ctrl/C** has been typed or a **STOP** statement has been executed.

COS COS (X)
Returns the cosine of X, where X is in radians.

CSNG CSNG (X)
Converts X to a single precision number.

CSRLIN CSRLIN
Obtains the current line position of the cursor in a numeric variable.

CVI CVI (⟨2-byte string⟩)
Converts string values to numeric values.

CVS CVS (⟨4-byte string⟩)
Converts string values to numeric values.

CVD CVD (⟨8-byte string⟩)
Converts string values to numeric values.

DATA DATA ⟨list of constants⟩
Stores the numeric and string constants that are accessed by the program's **READ** statement.

**DATE$** DATE$ [= ⟨string expression⟩]
Sets or retrieves the current date.

DEF FN DEF FN ⟨name⟩ [(⟨parameter list⟩)] = ⟨function definition⟩
Defines and names a function that is written by the user.

DEFINT DEFINT ⟨range(s) of letters⟩
Declares variable types as integer.

DEFSNG DEFSNG ⟨range(s) of letters⟩
Declares variable types as single precision.

DEFDBL DEFDBL ⟨range(s) of letters⟩
Declares variable types as double precision.

DEFSTR DEFSTR ⟨range(s) of letters⟩
Declares variable types as string.

DEF SEG DEF SEG [= ⟨address⟩]
Assigns the current segment address to be referenced by a subsequent **BLOAD**, **BSAVE**, **CALL**, **CALLS**, or **POKE** statement or by a **USR** or **PEEK** function.

DEF USR DEF USR [⟨digit⟩] = ⟨integer expression⟩
Specifies the starting address of an assembly language subroutine.

DELETE DELETE [⟨line number⟩] [-[⟨line number⟩]]
DELETE -⟨line number⟩
DELETE ⟨line number⟩-
Deletes program lines.

DIM DIM ⟨list of subscripted variables⟩
Specifies the maximum values for array variable subscripts and allocates storage accordingly.

DRAW DRAW ⟨string expression⟩
Draws an object defined by the subcommands.

EDIT EDIT ⟨line number⟩
Edits the specified line.

END END
Terminates program execution, closes all files, and returns to command level.

ENVIRON ENVIRON ⟨string⟩
Modifies a parameter in **MS-DOS**'s Environment String Table.

**ENVIRON$** ENVIRON$ (⟨string parameter⟩)
ENVIRON$ (⟨n⟩)
Retrieves a parameter string from BASIC's Environment String Table.

EOF EOF (⟨file number⟩)
Tests for the end-of-file condition.

ERASE ERASE ⟨list of array variables⟩
Eliminates arrays from memory.

ERDEV ERDEV
Provides a way to obtain device-specific status information.

**ERDEV$** ERDEV$
Provides a way to obtain device-specific status information.

ERL ERL
Returns an error code and line number associated with an error.

ERR ERR
Returns an error code and line number associated with an error.

ERROR ERROR ⟨integer expression⟩
Simulates the occurrence of a BASIC error, or allows error codes to be defined by the user.

EXP EXP (X)
Returns e (base of natural logarithms) to the power of X.

EXTERR EXTERR (n)
Returns **MS-DOS** extended error information.

FIELD FIELD [#] ⟨file number⟩, ⟨file width⟩ AS ⟨string variable⟩...
Allocates space for variables in a random file buffer.

FILES FILES [⟨filename⟩]
Prints the names of files residing on the specified disk.

FIX FIX (X)
Returns the truncated integer part of X.

FOR...NEXT FOR ⟨variable⟩ = x To y
[STEP z]
⋮
NEXT [⟨variable⟩] [, ⟨variable⟩...]

Allows a series of instructions to be performed in a loop a given number of times.

FRE FRE (0)

Returns the number of bytes in memory that are not being used by GW-BASIC.

FRE (" ")

Forces a garbage collection before running the number of free bytes.

GET GET [#] ⟨file number⟩ [, ⟨record number⟩]

Reads a record from a random disk file into a random file buffer.

GET (x1, y1) – (x2, y2), ⟨array name⟩

Transfers the screen image bounded by the rectangle described by the specified points into the array.

GOSUB...RETURN
GOSUB ⟨line number⟩
⋮
RETURN [⟨line number⟩]

Branches to, and returns from, a subroutine.

GOTO GOTO ⟨line number⟩

Branches unconditionally to a specified line number.

**HEX$** HEX$ (X)

Returns a string that represents the hexadecimal value of the decimal argument.

IF IF ⟨expression⟩ [,] THEN {⟨statement(s)⟩ | ⟨line number⟩} [[,] [ELSE {⟨statement(s)⟩ | ⟨line number⟩}]]
IF ⟨expression⟩ [,] [THEN] GOTO ⟨line number⟩ [[,] [ELSE {⟨statement(s)⟩ | ⟨line number⟩}]]
Makes a decision regarding program flow based on the result returned by an expression.

**INKEY$** INKEY$
Returns either a one-character string containing a character read from the standard input device or a null string if no character is pending there.

INP INP (I)
Returns the byte read from port I.

INPUT INPUT [;] ["⟨prompt string⟩" {; | ,}] ⟨list of variables⟩
Allows input from the keyboard during program execution.

INPUT# INPUT# ⟨file number⟩, ⟨variable list⟩
Reads data items from a sequential device or file, and assigns them to program variables.

**INPUT$** INPUT$ (X [, [#] Y])
Returns a string of X characters read from file number Y.

INSTR INSTR ([I,] X$, Y$)
Searches for the first occurrence of string Y$ in X$, and returns the position at which the match is found.

INT INT (X)
Returns the largest integer < = X.

IOCTL IOCTL [#] ⟨file number⟩, ⟨string⟩
Transmits a control character or string to a device driver.

**IOCTL$** IOCTL$ ([#] ⟨file number⟩)
Receives a control data string from a device driver.

KEY KEY n, X$
KEY LIST
KEY ON
KEY OFF
Displays and modifies the values of function keys.

KEY (n) KEY (n) {ON | OFF | STOP}
Controls interrupts generated by a function key.

KILL KILL [⟨filename⟩]
Deletes a file or a pathname from disk.

**LEFT$** LEFT$ (⟨string⟩, I)
Returns a string comprising the leftmost I characters of X$.

LEN LEN (⟨string⟩)
Returns the number of characters in ⟨string⟩.

LET [LET] ⟨variable⟩ = ⟨expression⟩
Assigns the value of an expression to a variable.

LINE LINE [[STEP] (x1, y1)] – [STEP] (x2, y2) [, [⟨color⟩] [, B [F]]] [, ⟨style⟩]]
Draws a line or box on the screen.

LINE INPUT LINE INPUT [;] ["⟨prompt string⟩" ;] ⟨string variable⟩
Inputs an entire line to a string variable, without the use of delimiters.

LINE INPUT# LINE INPUT# ⟨file number⟩, ⟨string variable⟩
Reads an entire line, without delimiters, from a sequential disk data file to a string variable.

LIST LIST [⟨line number⟩] [-[⟨line number⟩]] [, ⟨device⟩]

Lists all or part of the program currently in memory.

LLIST LLIST [⟨line number⟩ [-[⟨line number⟩]]]

Lists all or part of the program currently in memory on the line printer.

LOAD LOAD ⟨filename⟩ [, R]

Loads a file from an input device into memory.

LOC LOC (⟨file number⟩)

Returns the actual record number within the file or returns the current byte position in the file.

LOCATE LOCATE [row] [, [col] [, [cursor] [, [start] [, stop]]]]

Moves the cursor to the specified position.

LOCK...UNLOCK

LOCK [#] ⟨file number⟩ [, ⟨record⟩ | [⟨start⟩] TO ⟨end⟩]

⋮

UNLOCK [#] ⟨file number⟩ [, ⟨record⟩ | [⟨start⟩] TO ⟨end⟩]

Controls access by other processors to all or part of an opened file.

LOF LOF (⟨file number⟩)

Returns the length of the named file in bytes.

LOG LOG (X)

Returns the natural logarithm of X.

LPOS LPOS (X)

Returns the current position of the printer's print head within the printer buffer.

LPRINT LPRINT [⟨list of expressions⟩]

Prints data on the printer.

LPRINT USING

LPRINT USING ⟨string exp⟩; ⟨list of expressions⟩

Prints data on the printer.

LSET LSET ⟨string variable⟩ = ⟨string exp⟩

Moves data from memory to a random file buffer or left-justifies the value of a string into a string variable.

MERGE MERGE ⟨filename⟩

Merges a specified file saved in ASCII format into the program currently in memory.

**MID$** MID$ (⟨string 1⟩, n [, m]) = ⟨string 2⟩

Replaces a portion of one string with another string.

MID$ (⟨string⟩, n [, m])

Returns a string of length m characters from ⟨string⟩, beginning with the n-th character.

MKDIR MKDIR ⟨path⟩

Creates a new directory.

**MKI$** MKI$ (⟨integer expression⟩)

Converts numeric values to string value.

**MKS$** MKS$ (⟨single precision expression⟩)

Converts numeric values to string value.

**MKD$** MKD$ (⟨double precision expression⟩)

Converts numeric values to string values.

NAME NAME ⟨old filename⟩ AS ⟨new filename⟩

Changes the name of a disk file.

NEW NEW

Deletes the program currently in memory and clears all variables.

**OCT$** OCT$ (X)

Returns a string that represents the octal value of the decimal argument.

ON COM ON COM (n) GOSUB ⟨line number⟩

Specifies the first line number of a subroutine to be performed when activity occurs on a communications port.

ON ERROR GOTO

ON ERROR GOTO ⟨line number⟩

Enables error handling and specifies the first line of the error handling routine.

ON...GOSUB ON ⟨expression⟩ GOSUB ⟨list of line numbers⟩

Branches to one of several specified line numbers, depending on the value returned when an expression is evaluated.

ON...GOTO ON ⟨expression⟩ GOTO ⟨list of line numbers⟩

Branches to one of several specified line numbers, depending on the value returned when an expression is evaluated.

ON KEY ON KEY (n) GOSUB ⟨line number⟩

Specifies the first line number of a subroutine to be performed when a specified key is pressed.

ON PLAY ON PLAY (n) GOSUB ⟨line number⟩

Branches to a specified subroutine when the music queue contains fewer than (n) notes.

ON TIMER ON TIMER (n) GOSUB ⟨line number⟩

Provides an event trap during real time.

OPEN OPEN ⟨filename⟩ [FOR ⟨model 1⟩] [⟨ACCESS atype⟩] [⟨ltype⟩] AS [#] ⟨file number⟩ [LEN = ⟨record length⟩]
OPEN ⟨mode 2⟩, [#] ⟨file number⟩, ⟨filename⟩ [, ⟨record length⟩]

Allows I/O to a file or device.

OPEN COM OPEN "COMn: [⟨speed⟩] [, [⟨parity⟩] [, [⟨data⟩] [, [⟨stop⟩] [, RS] [, CS [n]] [, DS [n]] [, CD [n]] [, BIN] [, ASC] [, LF]]]]" [FOR ⟨mode⟩] AS [#] ⟨filenumber⟩ [LEN = ⟨record length⟩]

Opens and initializes a communications channel for input/output.

OPTION BASE

OPTION BASE n

Declares the minimum value for array subscripts.

OUT OUT I, J

Sends a byte to a machine output port.

PAINT PAINT (X, Y) [, ⟨paint⟩ [, ⟨bordercolor⟩] [, ⟨background⟩]]

Fills a graphics area with the color or pattern specified.

PALETTE PALETTE [⟨attribute⟩, ⟨color⟩]

Changes one or more of the colors in the palette.

PALLETTE USING

PALETTE USING ⟨arrayname⟩ ⟨arrayindex⟩

Changes one or more of the colors in the palette.

PCOPY PCOPY ⟨sourcepage⟩, ⟨destinationpage⟩

Copies one screen page to another in all screen modes.

PEEK PEEK (I)

Returns the byte read from the indicated memory location (I).

PLAY PLAY ⟨string⟩

Plays music as specified by ⟨string⟩.

PLAY (n)

Returns the number of notes currently in the background music queue.

PLAY ON PLAY ON

Enables play event trapping.

PLAY OFF PLAY OFF

Disables play event trapping.

PLAY STOP PLAY STOP

Suspends play event trapping.

PMAP PMAP ⟨expression⟩, ⟨function⟩
Maps world coordinate expressions to physical locations or maps physical expressions to a world coordinate location.

POINT POINT (⟨x coordinate⟩, ⟨y coordinate⟩)
Allows the user to read the color number of a pixel from the screen.
POINT (⟨function⟩)
Allows the user to retrieve the current graphics cursor coordinates.

POKE POKE I, J
Writes a byte into a memory location.

POS POS (I)
Returns the current horizontal (column) position of the cursor.

PRESET PRESET [STEP] (⟨x coordinate⟩, ⟨y coordinate⟩) [, ⟨color⟩]
Draws a specified point on the screen. PRESET works exactly like **PSET** except that if the ⟨color⟩ is not specified, the background color is selected.

PRINT PRINT [⟨list of expressions⟩]
Outputs data on the screen.

PRINT USING
PRINT USING ⟨string exp⟩; ⟨list of expressions⟩
Prints strings or numbers using a specified format

PRINT# and PRINT# USING
PRINT# ⟨file number⟩, [USING ⟨string exp⟩;] ⟨list of expressions⟩
Writes data to a sequential file.

PSET PSET [STEP] (⟨x coordinate⟩, ⟨y coordinate⟩) [, ⟨color⟩]
Allows the ⟨color⟩ to be left off the command line.

PUT PUT [#] ⟨file number⟩ [, ⟨record number⟩]
Writes a record from a random buffer to a random access file.

PUT PUT (x1, y1), ⟨array name⟩ [, action verb]
Transfers the image stored in the array onto the screen.

RANDOMIZE RANDOMIZE [⟨expression⟩]
Receeds the random number generator.

READ READ ⟨list of variables⟩
Reads values from a **DATA** statement and assigns them to variables.

REM REM ⟨remark⟩
Allows explanatory remarks to be inserted in a program.

RENUM RENUM [[⟨new number⟩] [, [⟨old number⟩] [, ⟨increment⟩]]]
Renumbers program lines.

RESET RESET
Closes all files.

RESTORE RESTORE [⟨line number⟩]
Allows **DATA** statements to be reread from a specified line.

RESUME RESUME
RESUME 0
RESUME NEXT
RESUME ⟨line number⟩
Continues program execution after an error recovery procedures has been performed.

**RIGHT$** RIGHT$ (X$, I)
Returns the rightmost I characters of string X$.

RMDIR RMDIR ⟨pathname⟩
Removes an existing directory.

RND RND [(x)]
Returns a random number between 0 and 1.

RSET RSET ⟨string variable⟩ = ⟨string exp⟩
Moves data from memory to a random file buffer or right-justifies the value of a string into a string variable.

RUN RUN [⟨line number⟩]
RUN ⟨filespec⟩ [, R]
Executes the program currently in memory, or to load a file into memory and run it.

SAVE SAVE ⟨filespec⟩ [, {A | P}]
Saves a program file.

SCREEN SCREEN [⟨mode⟩] [, [⟨color mode⟩] [, [⟨active page⟩] [, ⟨visual page⟩]]]
Sets the specifications for the display screen.

SCREEN SCREEN (⟨row⟩, ⟨column⟩ [, z])
Reads a character or its color from a specified screen location.

SGN SGN (X)
Indicates the value of X, relative to zero.

SHELL SHELL [⟨command-string⟩]
Exits the BASIC program, runs a **COM** or **EXE** or **BAT** program, or a built-in **DOS** function such as **DIR** or **TYPE**, and returns to the BASIC program at the line after the **SHELL** statement.

SIN SIN (X)
Returns the sine of X, where X is in radians.

SOUND SOUND ⟨freq⟩, ⟨duration⟩
Generates a sound through the speaker.

**SPACE$** SPACE$ (I)
Returns a string of spaces of length I.

SPC SPC (n)
Skips spaces in a **PRINT** statement.
n is the number of spaces to be skipped.

SQR SQR (X)
Returns the square root of X.

STOP STOP
Terminates program execution and returns to command level.

**STR$** STR$ (n)
Returns a string representation of the value of n.

**STRING$** STRING$ (I, J)
STRING$ (I, X$)
Returns a string of length I whose characters all have ASCII code J or the first character of X$.

SWAP SWAP ⟨variable⟩, ⟨variable⟩
Exchanges the values of two variables.

SYSTEM SYSTEM
Closes all open files and returns control to the operating system.

TAB TAB (I)
Moves the print position to I.

TAN TAN (X)
Returns the tangent of X. (X should be given in radians.)

**TIME$** TIME$ = ⟨string expression⟩
Sets the time. This statement complements the TIME$ function, which retrieves the time.

**TIME$** TIME$
Retrieves the current time.

TIMER TIMER
Returns number of seconds having passed since midnight or system reset.

TIMER ON TIMER ON
Enables event trapping during real time.

TIMER OFF TIMER OFF
Disables event trapping during real time.

TIMER STOP TIMER STOP
Suspends real time event trapping.

TRON/TROFF

TRON
TROFF

Traces the execution of program statements.

USR USR [⟨digit⟩] [(⟨argument⟩)]

Calls an assembly language subroutine.

VAL VAL (⟨string⟩)

Returns the numeric value of string ⟨string⟩. The VAL function also strips leading blanks, tabs, and linefeeds from the argument string.

VARPTR 1 VARPTR (⟨variable name⟩)
2 VARPTR (# ⟨filename⟩)

1 Returns the address of the first byte of data identified with ⟨variable name⟩.

2 For sequential files, returns the starting address of the disk I/O buffer assigned to ⟨file number⟩.
For random files, returns the address of the **FIELD** buffer assigned to ⟨file number⟩.

**VARPTR$** VARPTR$ (⟨variable name⟩)

Returns a character from the memory address of the variable in a form that is compatible for programs that may later be compiled.

VIEW VIEW [[SCREEN] [(Vx1, Vy1) – (Vx2, Vy2) [, [⟨color⟩] [, [⟨border⟩]]]]]

Defines screen limits for graphics activity.

VIEW PRINT VIEW PRINT [⟨top screen line⟩ TO ⟨bottom screen line⟩]

Sets the boundaries of the screen text window.

WAIT WAIT ⟨port number⟩, I [, J]

Suspends program execution while monitoring the status of a machine input port.

WHILE...WEND

```
WHILE ⟨expression⟩
  .
  .
[⟨loop statements⟩]
  .
  .
WEND
```

Executes a series of statements in a loop as long as a given condition is true.

WIDTH

```
WIDTH [LPRINT] ⟨size⟩
WIDTH ⟨file number⟩, ⟨size⟩
WIDTH ⟨device⟩, ⟨size⟩
```

Sets the printed line width in number of characters for the screen or line printer.

WINDOW

```
WINDOW [[SCREEN] (Wx1, Wy1) –
(Wx2, Wy2)]
```

Defines the logical dimensions of the current viewpoint.

WRITE

```
WRITE [⟨list of expressions⟩]
```

Outputs data to the screen.

WRITE#

```
WRITE# ⟨file number⟩, ⟨list of expressions⟩
```

Writes data to a sequential file.

Troubleshooting

Below is a chart to help solve problems that might occur while running your computer. If you can't locate the problem you are experiencing on the system, call your Sharp dealer.

Problem	Suspect Area	Solution
No power to the main unit	Power switch button	Push on the power switch button
	Lead Battery	Charge with AC adaptor
	AC Adaptor	Plug one end into main unit and the other end into outlet. Be sure ends are plugged in all the way
	Faulty outlet	Plug power cord into a different outlet
	Faulty system	Call your Sharp dealer
Computer's screen is blank	Main unit power	Make sure AC adaptor plug is properly attached to main unit and plugged into an outlet – Make sure main unit is turned on
		Set dip switch 1 to ON and then OFF
	Faulty screen power supply	Call your Sharp dealer
Computer's screen is dim	Contrast control	Adjust the control
	Backlight automatic shut off	Press any key on the keyboard
	Backlight adjustment	Change the backlight setting on the set up screen
	Backlight degraded	Contact sharp dealer

Problem	Suspect Area	Solution
Unable to enter information at keyboard		Turn off main unit power, and turn power on again.
System unable to read floppy diskette	Disk drive is not locked	Insert diskette to the end
	Diskette inserted improperly	Re-insert diskette with the label side facing upward
	Bad diskette	Use another diskette
	Faulty disk drive	Contact Sharp dealer
No data printed by printer	Power	Be sure power cord is connected and power is turned on
	Online	Be sure printer is online
	Cable	Be sure printer cable is connected
	Supplies	Be sure you are using appropriate paper and ribbons
Nothing displays on the CRT	Power	Check that CRT power is turned on
	Brightness	Check that the CRT brightness control is adjusted appropriately
	Contrast	Check that the CRT contrast is adjusted appropriately
	Cable	Check that the CRT cable is connected
	CE-451A	Check that the CRT adaptor is installed properly
CE-451M modem card does not function	Set up function	Check set up function See Chapter 6
	Cables	Check that the phone cable is connected to the phone and the wall cable is connected to the wall jack
	CE-451M	Check that the modem card is properly installed
CE 451B serial I/O card does not function	Set up function	Check set up function See Chapter 6
	Cables	Check that SIO cable is connected to other equipment.
	CE-451B	Check that the serial I/O card is properly installed.

Problem	Suspect Area	Solution
CE-452F 5-1/4" floppy disk drive	Power	Check that disk drive power is turned on.
	Cable	Check that the 5-1/4" floppy disk drive cable is connected
	Disk drive is not locked	Turn the lock lever horizontally.
	Diskette inserted improperly	Re-insert diskette with the relief notch side first and the label side facing the left side of the disk drive
	Bad diskette	Use another diskette
	Faulty disk drive	Contact Sharp dealer

Specifications

The table below provides technical information about the components that make up the computer.

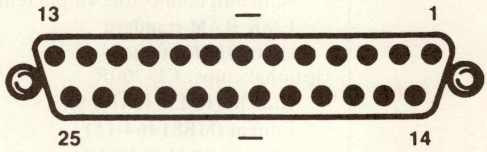
Item	Specification
Color/monochrome CRT adaptor card (optional)	Size: 60mm (W) x 134mm (H) (2-3/8" (W) x 5-3/8" (H)) Weight: Approx. 0.075 kg (0.17 lbs) Emulation: CGA/MDA mode selectable Interface: Direct connection to bus Main Unit Connector: 50-pin female connector Color CRT connector: 9-pin female connector
External 5-1/4" floppy disk drive (optional)	One 5-1/4 inch drive with the following: Capacity: 500K unformatted Size: 118mm (W) x 331mm (D) x 189mm (H) (4-3/4" (W) x 13" (D) x 7-1/2" (H)) Weight: Approx. 5.1 kg (11.3 lbs) Power source: 120V AC, 60 Hz Operating Temperature: 10 to 35 degrees C (50 to 95 degrees F) Storage Temperative: –20 to 60 degrees C (–4 to 140 degrees F) Operating Humidity: 20 to 80% Storage Humidity: 10 to 90%
External 5-1/4" floppy disk port	Interface: CE-452F 5-1/4" floppy disk drive unit exclusive-use
Hard disk drive (PC-4521 only)	3.5 inch hard disk with the following: Capacity: 20M bytes Number of Cylinders: 615 Number of Tracks: 615 x 2 Number of Sectors: 34/track Number of Bytes: 512 bytes/sector Number of Heads: 2

Item	Specification
Internal floppy disk drive	3-1/2 inch with the following: Capacity: 1M unformatted
Keyboard	88 keystrokes including: 10 programmable function keys; 11 numeric keypad; 57 typewriter keys; 4 separated cursor keys; 4 control keys (Set Up, Esc, Ins, Del); 3 lock keys (NumLock, Scroll Lock, CapsLock)
Main unit	Size: 307mm (W) x 348mm (D) x 76mm (H) (12-1/8" (W) x 13-3/4" (D) x 3" (H)) Weight: (without AC adaptor) PC-4502: 5.0 kg (11.0 lbs) PC-4521: 5.6 kg (12.4 lbs) Power source: Lead battery, AC adaptor Operating temperature: 10 to 35 degrees C (50 to 95 degrees F) Storage temperature: –20 to 60 degrees C (–4 to 140 degrees F) Operating humidity: 20 to 80% Storage humidity: 10 to 90%
Modem card (optional)	Size: 95mm (W) x 140mm (H) (3-3/4" (W) x 5-1/2" (H)) Weight: Approx. 0.15 kg (0.33 lbs) Modem/Serial I/O mode selectable Modem Transmission method: Asynchronous Baud rate: 110, 150, 300, 1200 Modulation method: FSK (110, 150, 300, baud), PSK (1200 baud) Interface: Direct connection to bus Main unit connector: 34-pin female connector Phone connector: 4-pin female connector Serial I/O: Interface: RS-232C Transmission method: Asynchronous full or half duplex Baud rate: 110, 150, 300, 600, 1200, 2400, 4800, 9600 Data length: 7 or 8 bits Party check: None, even or odd Stop bit: 1 or 2 bits Connector: 25-pin male, type D-shell
Parallel I/O port	Interface: Centronics Connector: 25 pin female, type D-shell
Processor	80188 compatible with 7.16 MHz clock

Item	Specification
RAM (optional)	RAM Card: CE-451R Size: 44 mm (W) x 121mm (H) (1-3/4" (W) x 4-3/4" (H)) Weight: Approx. 0.05 kg (0.11 lbs) Interface: Direct connection to bus Main unit connector: 40-pin female connector 128K RAM standard Up to 384K memory Optional chips: CE-700R Hitachi (HM50464P-15) Fujitsu (MB81464-15) NEC (μPD41464C-15) Toshiba (TMM 41464P-15)
RAM (standard)	PC-4502: 256K PC-4521: 640K
ROM	32K EP-ROM with IPL, BIOS, selfcheck, CG, and set up functions
Screen	Screen type: Super twist liquid crystal display View area: 25 lines by 80 characters Graphics: 640 by 200 pixels bit-mapped Character size: 8 by 8 dots
Serial I/O card (optional)	Size: 95mm (W) x 140mm (H) (3-3/4" (W) x 5-1/2" (H)) Weight: Approx. 0.08 kg (0.18 lbs) Interface: RS-232C Transmission method: Asynchronous full or half duplex Baud rate: 110, 150, 300, 600, 1200, 2400, 4800, 9600 Data length: 7 or 8 bits Parity check: None, even, or odd Stop bit: 1 or 2 bits Connector: 25-pin male, type D-shell

Pin Layout

Parallel Connector. The following is a pin location diagram for the parallel connector port on the computer:

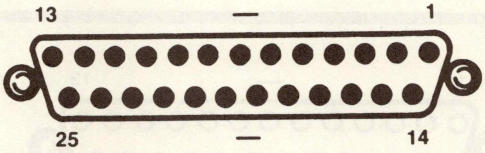


The following table describes the pins for the parallel connector:

Pin Number	Signal Name	Input/Output
1	Strobe	Output
2	Date 0	Output
3	Data 1	Output
4	Data 2	Output
5	Data 3	Output
6	Data 4	Output
7	Data 5	Output
8	Data 6	Output
9	Data 7	Output
10	Acknowledge	Input
11	Busy	Input
12	Paper-end	Input
13	Select	Input
14	Auto feed	Output
15	Printer error	Input
16	Initialize printer	Output
17	Select input	Output
18-25	Ground	

5-1/4" Floppy Disk Drive Unit Connector

The following is a pin location diagram for the 5-1/4" floppy disk connector port on the computer:

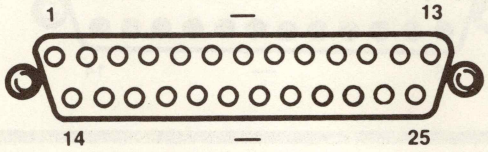


The following table describes the pins for the 5-1/4" floppy disk connector:

Pin Number	Signal Name	Input/Output
1		
2	IDX	Input
3	TK00	Input
4	WPT	Input
5	RD02	Input
6		
7		
8		
9	DS3	Output
10	DS2	Output
11	MON	Output
12	WDT2	Output
13	WTG2	Output
14		
15	HSL2	Output
16	DRTN2	Output
17	STP2	Output
18-25		

Serial Connector

The following is a pin location diagram for the connector port on the CE-451B serial I/O card or the serial I/O adaptor on the CE-451M modem card:

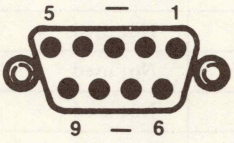


The following table describes the pins of the serial connector:

Pin Number	Signal Name	Input/Output
1	Frame ground	
2	Transmit data	Output
3	Receive data	Input
4	Request-to-send	Output
5	Clear-to-send	Input
6	Data-set-ready	Input
7	Signal ground	
8	Carrier detect	Input
20	Data terminal ready	Output
22	Calling indicator	Input

Color/Monochrome CRT Connector

The following is a pin location diagram for the CE-451A color/monochrome CRT adaptor connector port:



The following table describes the pins for the color/monochrome CRT connector:

In the color mode:

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Red Output	
4	Green Output	
5	Blue Output	
6	Intensity	Output
7	Not used	
8	Horizontal synch	Output
9	Vertical synch	Output

In the monochrome mode:

Pin Number	Signal Name	Input/Output
1	Ground	
2	Ground	
3	Not used	
4	Not used	
5	Not used	
6	Intensity	Output
7	Video	Output
8	Horizontal synch	Output
9	Vertical synch	Output

Glossary

The following is a list of terms used in the Operation Manual.

application software: A series of inter-related programs designed to carry out a specific task such as word processing or graphics.

asynchronous: A mode of computer operation in which information is processed in a line or string preceded by a start bit and ended by stop bits.

baud rate: The transmission rate of information; typically used when describing data communications.

binary: A numbering system based on 1's and 0's widely used in computer processing.

bit: A binary digit; the smallest piece of information handled by computers.

byte: Unit in which data is processed; usually 8 bits.

card: An internal plug-in containing printed circuits and electrical components.

CPI: Characters per inch.

CPS: Characters per second.

CRT: Cathode ray tube; output device on which information is displayed.

data bits: Indicates length of a character (7 or 8 bits).

diskette: A flexible, magnetized, disk-shaped platter housed in a square jacket. It is inserted into a floppy disk drive to read/write information.

hardware: The equipment and components that comprise a computer system, i.e., keyboard, memory chips, printer.

I/O: Input/Output.

K: A symbol that represents capacity; i.e., 1K 1024 bytes.

modem: An acronym for MOdulator DEModulator, the device is used primarily in sending and receiving data from one computer to another via telephone lines.

operating system software: Software that controls system resources such as memory, disk drives, processor, etc.

parallel I/O port: The connector point for external parallel devices, usually printers. Bits are transmitted simultaneously.

parity: A method of checking the accuracy of data.

RAM: Random Access Memory, a temporary storage space for information being worked on by the processor.

ROM: Read Only Memory, a permanent storage space for software.

serial I/O port: The connector point for external serial devices such as modems. Bits are transferred one by one.

spreadsheet application: Software that uses entries made into columns and rows to perform calculations.

software: Programs that contain coded instructions to direct a computer system to perform various operations.

stop bits: The number of bits that mark the end of a character.

word processing application: Software that is used to create and edit text documents.

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PERSONAL COMPUTER
PC-4502
PC-4521

OPERATION MANUAL

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